Installation Instructions

Allen-Bradley

CENTERLINE 2500 Low Voltage Motor Control Centers

Catalog Numbers 2500

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

	SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Allen-Bradley, ArcShield, CENTERLINE, E1 Plus, E3 Plus, E300, IntelliCENTER, POINT I/O, PowerFlex, Rockwell Automation, Rockwell Software, RSLinx, RSLogix, RSNetworx, SMC, Stratix 5700, and Stratix 6000 are trademarks of Rockwell Automation, Inc.

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This manual contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the right of this paragraph.

New and Updated Information

This table contains the changes made to this revision.

Topic	Page
Corrected the kiloamp rating shown for protection	11
Added E300™ relay as an available electronic overload relay	12
Added double-front depth and footnote to Table 3	14
Added dimension and footnote to Figure 2	14
Added note to Figure 5	16
Revised information in Technical Data table	17
Updated nameplate and unit identification labels in Figures 6, 7, and 8	18, 19
Updated humidity information in Environment section	24
Updated torque numbers for horizontal power bus connections	43
Updated environment information in Suggested Maintenance Guidelines table	74
Updated Stratix model number to 5700 in Figure 25	79
Updated artwork to show new large rotary-operator handle	Throughout publication

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Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
CENTERLINE 2500 Receiving Handling and Storage Instructions, publication 2500-IN002	Provides information about receiving, handling, and storage of CENTERLINE® 2500 MCCs.
CENTERLINE 2500 EtherNet/IP Motor Control Centers, publication 2500-TD003	Provides information about EtherNet/IP MCCs.
EtherNet/IP Network Configuration User Manual, publication ENET-UM001	Provides information to design, install, and troubleshoot an EtherNet/IP network system.
CENTERLINE 2500 DeviceNet™ Motor Control Centers, publication 2500-TD002	Provides information about DeviceNet MCCs.
DeviceNet Media Design User Manual, publication DNET-UM072	Provides information to design, install, and troubleshoot a DeviceNet cable system.
IntelliCENTER Software User Guide, publication MCC-UM001	Provides information about installing and using IntelliCENTER® software on CENTERLINE MCCs.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1	Provides general guidelines for installing and maintaining solid state control components.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Purchased Components and Additional Instruction Sheets

Manuals and data sheets for specific components inside the motor control center (for example, transformers, metering devices, electronic overloads, PLCs, soft starters, and drives) are shipped inside the motor control center. These manuals and data sheets must be read and understood before installing and operating the motor control center. Keep these manuals and other documentation for future reference.

Notes:

System Overview

CENTERLINE 2500 Motor Control Centers (MCCs) are designed for applications that must comply with international standards and practices for low voltage motor control centers. The CENTERLINE 2500 MCC is ideal for tough, demanding industrial applications where uptime and ease of maintenance is required.

The time-proven CENTERLINE power bus structure distributes line power throughout the MCC via an isolated bus work structure. Standard, center-fed, 300 A rated vertical bus supplies power to the individual units above and below the horizontal bus for an effective 600 A capacity and virtually unrestricted unit arrangement. An optional 600 A vertical bus provides an effective rating of 1200 A.

ArcShield Rating

The CENTERLINE MCC is also available with an ArcShield™ rating. The ArcShield rating includes arc-resistant features for enhanced protection in the event of internal arcing faults.

In addition to standard safety features of the CENTERLINE 2500 MCC, the ArcShield option provides the following:

- Spring latches
- Reinforced structure
- Pressure relief vent system through the top of the enclosure
- Protection up 300 ms at 480V/65 kA

Table 1 - Conformity Ratings for CENTERLINE 2500 MCC with ArcShield

Value	Description
Ratings: Ue Ip arc tarc Ipc arc	 480V 65 kA 300 ms 65 kA
Protection	Personal protection and assembly protection suitable for limited continued operation; assembly protection is limited to outgoing units tested for conditional current under arcing conditions.
Requirements	IEC/TR 61641, ed. 2.0 2008-1

An ArcShield label is provided on the MCC with information about the accessibility level and arc fault ratings. See Figure 9 on page 20 for an example of this rating label and its location.

See Figure 4 on page 16 for the location of ArcShield structure protection and page 50 for ArcShield door latches.

For more information, refer to guidelines addressed in IEC Standard 60364-5-52.

IntelliCENTER Software

CENTERLINE 2500 MCCs with IntelliCENTER software provides you with an integrated hardware, software, and communication solution. It features preconfigured software that provides real-time data, trending, component history, wiring diagrams, user manuals, and spare parts. IntelliCENTER offers plug-and-play setup, troubleshooting, hardware configuration changes without opening enclosure doors, and convenient change tracking. It also provides intelligent diagnostic and predictive failure information.

IntelliCENTER technology improves the intelligence of your MCC by using built-in networking to capture information used for predictive maintenance, process monitoring, and advanced diagnostics.

IntelliCENTER Features

- Built-in networking
  - EtherNet/IP or DeviceNet
  - Media protected behind barriers
  - Access ports in wireways
  - Topology lets you add and remove devices without interrupting any other device on the network
- Intelligent motor controls
  - PowerFlex® drives
  - SMC™-3 and SMC-Flex soft starters
  - E300, E1 Plus™, and E3 Plus™ electronic overload relays
- IntelliCENTER software
  - Distributed IO
  - POINT I/O™ system/DSA
  - Virtual MCC
  - Parameter editor
  - Status dashboards
  - Documentation management
  - Spare parts information
- Factory configuration
  - IP address network media validation
  - IP address node configuration
  - Communication check
  - Network commissioning

IntelliCENTER Software

IntelliCENTER MCCs can be provided with pre-configured IntelliCENTER software. The software is capable of viewing, managing, and configuring multiple MCC line-ups. The IntelliCENTER software communication driver lets the software be installed and operated on EtherNet/IP or DeviceNet. The IntelliCENTER software can function as a stand alone software package or as an ActiveX control in a human machine interface (HMI).

Structure

CENTERLINE 2500 MCCs offer units with a full complement of AC drives, soft starters, and other devices. Pluggable power connections on the back of the unit plug into the vertical bus. A mechanical interlock helps prevent the unit door from being opened while the main switch is in the ON/I position. An additional mechanical interlock helps prevent the unit from being withdrawn or inserted when the unit main switch is closed. Separate vertical wireways isolate control and network cables from power wiring. Units are available as fixed or fully withdrawable.

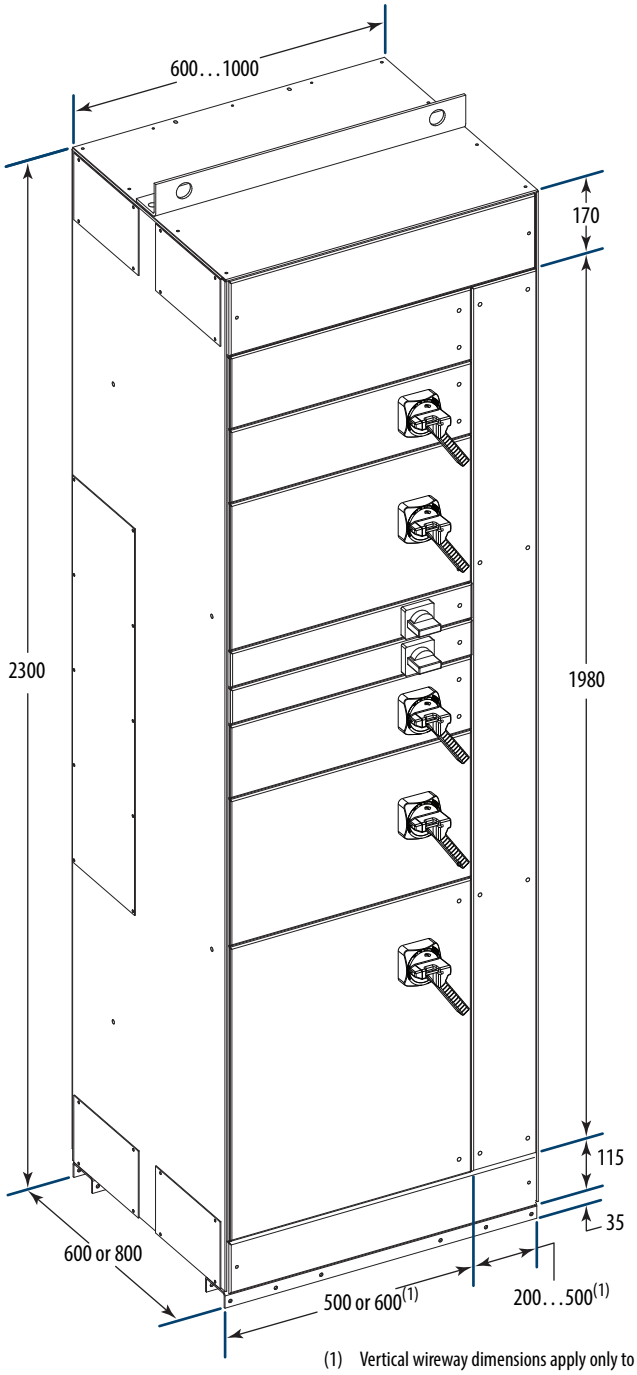
Figure 1 - CENTERLINE 2500 MCC

Dimensions

CENTERLINE 2500 MCCs are designed in widths between 600 and 1,000 mm. Each column is 2300 mm high and either 600 mm or 800 mm deep. Double-front columns are also available. See the column tables below for additional options.

Unit size is described in terms of modules. Each module is approximately 80 mm high. Columns can accommodate 24 modules of varying unit combinations.

Figure 2 - Typical Column Dimensions



All measurements are in mm unless otherwise specified.

Table 2 - Column Width

Total Column Width	Unit Width	Vertical Wireway Width
600(1)	600	No vertical wireway
700	500	200
800		300
900		400
1000		500

(1) Only for full-column, frame mount applications.

Table 3 - Column Depth

Single-front	Double-front
600	1200
800	1600 or 2000(1)

(1) 800 mm columns can be mounted in a double-front arrangement on site. A 400 mm air gap is required between 3200 A and 4000 A double-front columns.

Table 4 - Column Height

Dimension	Measurement
Total Height	2300
Available Unit Height	1980
Top Horizontal Wireway	170
Bottom Horizontal Wireway	115
External Mounting Channel	35

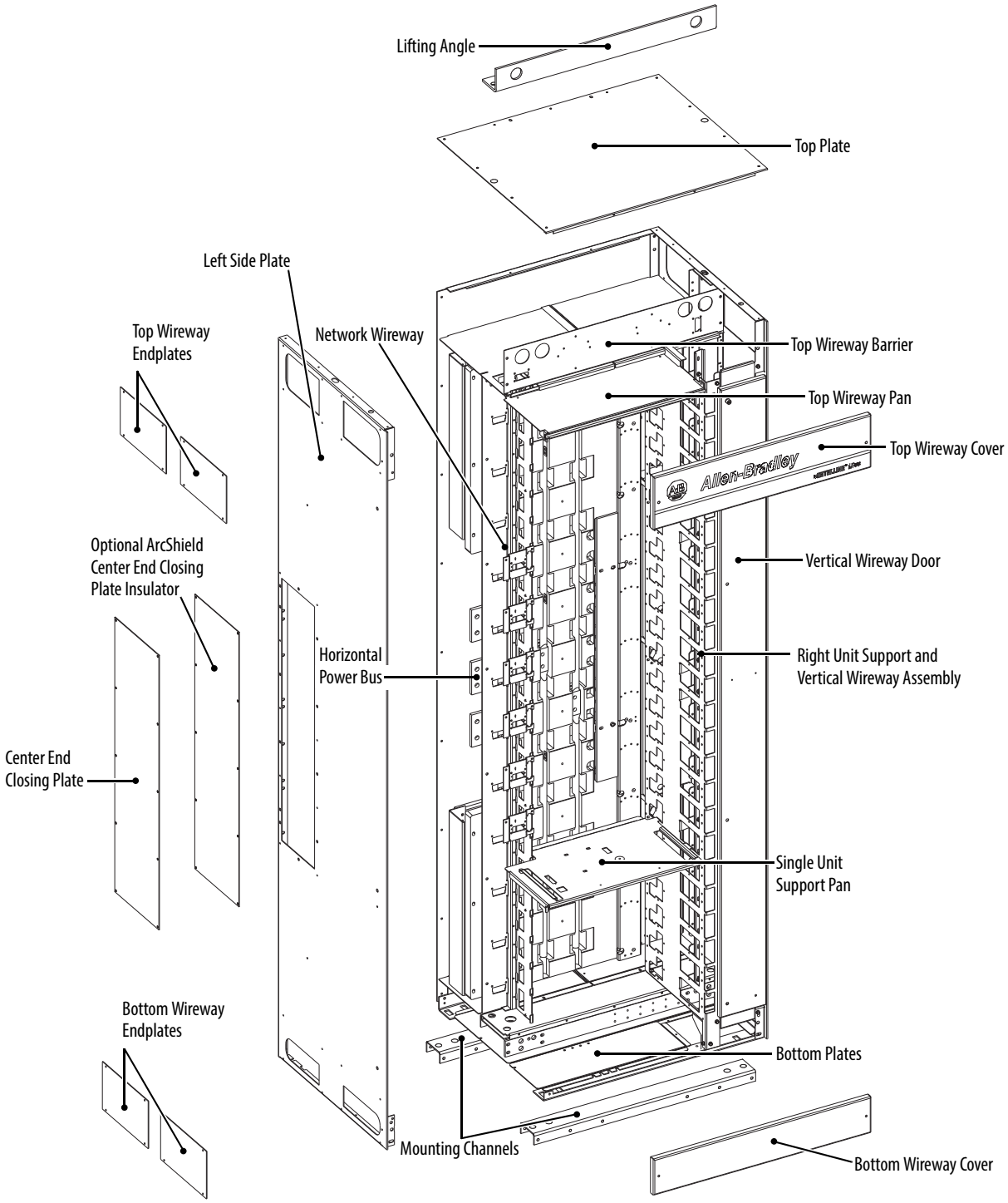
(1) Vertical wireway dimensions apply only to 500 mm wide units.

Typical Column Construction

Columns are rigid, free-standing structures with heavy-duty external mounting channels continuous for the width of the shipping block. Columns are secured at the installation site by bolting through clearance holes in the mounting channel or by welding.

The standard for internal sheet metal parts is G90 galvanized metal for Series C CENTERLINE 2500 Motor Control Centers.

Figure 3 - Typical Column



Additional bracing is provided for ArcShield columns.

Figure 4 - ArcShield Column Protection Hardware

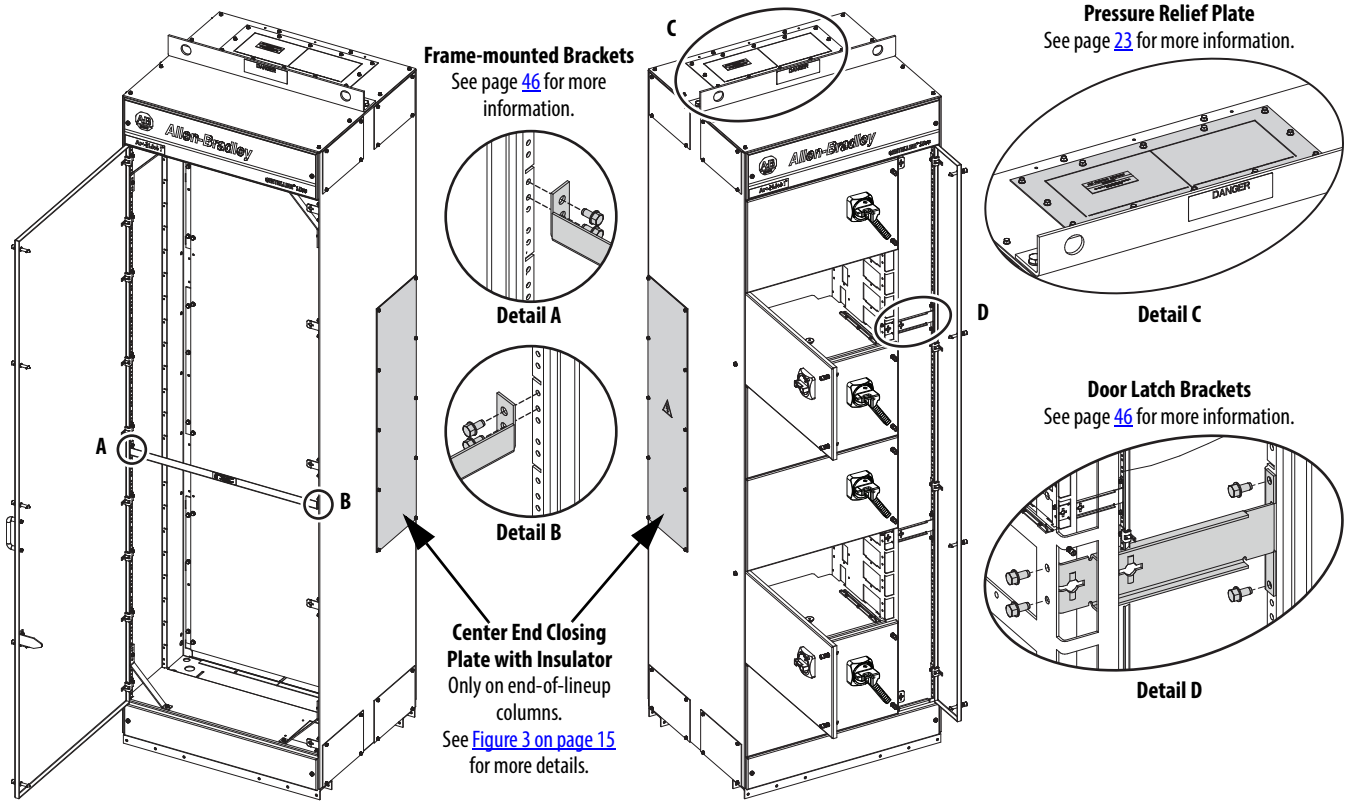


Figure 5 - Column Configuration

Columns Installed in a Single-front Configuration

Columns Installed in a Double-front Configuration

NOTE: A 400 mm air gap is required between 3200 A and 4000 A configurations.

Technical Data

This table provides the technical specifications for the 2500 MCC.

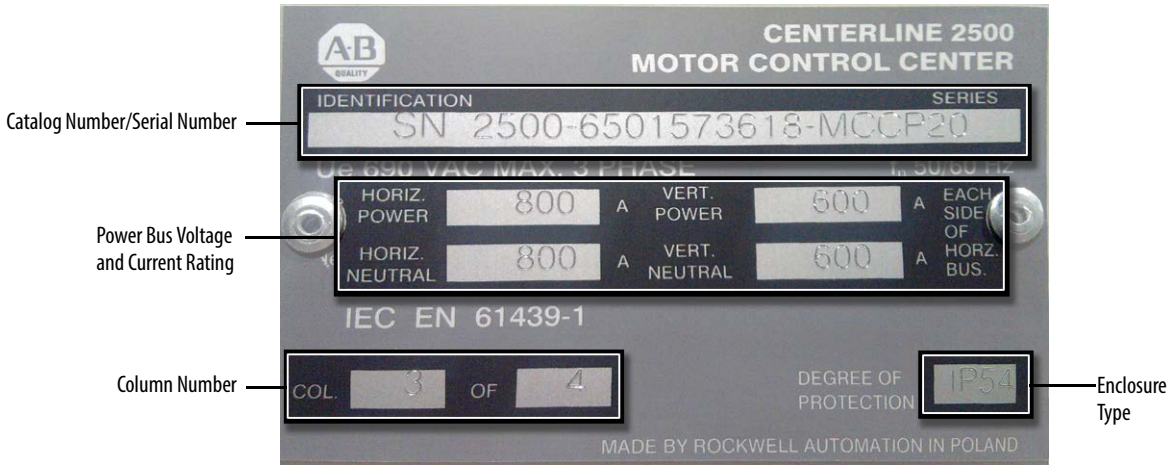
Standards	EN 60204-1:2006	Safety of machinery – electrical equipment of machines; Part 1: General requirements	
	IEC 61439-1 Ed. 2.0 b:2011	Low-voltage switchgear and controlgear assemblies; Part 1: General rules	
EC Directives	IEC/TR 61641, ed. 2.0 2008-1	Enclosed low-voltage switchgear and controlgear assemblies – guide for testing under conditions of arcing due to internal fault	
	2004/108/EC	EMC directive	
	2006/95/EEC	Low voltage directive	
Certifications and Markings	ABS ABS Shipboard	http://www.rockwellautomation.com/rockwellautomation/certification/marine.page?	
	C-Tick	http://www.rockwellautomation.com/rockwellautomation/certification/c-tick.page?	
	CE Conformance Marked	http://www.rockwellautomation.com/rockwellautomation/certification/ce/page?#Motor	
	China Compulsory Certificate (CCC)	http://www.rockwellautomation.com/rockwellautomation/certification/china.page?#motorcontrol	
	DEKRA	http://www.rockwellautomation.com/rockwellautomation/certification/third.page?	
	GOST-R	http://www.rockwellautomation.com/rockwellautomation/certification/gost/page?#/tab1	
	IBC 2010	http://www.rockwellautomation.com/rockwellautomation/certification/overview.page?	
	ICC–ES AC156	http://www.rockwellautomation.com/rockwellautomation/certification/overview.page?	
	IEEE 344	http://www.rockwellautomation.com/rockwellautomation/certification/overview.page?	
	KEMA	http://www.rockwellautomation.com/rockwellautomation/certification/third.page?	
	SEI/ASCE 7-05 and 7-10	http://www.rockwellautomation.com/rockwellautomation/certification/overview.page?	
Rated Voltages	Rated operating voltage, U_e	Up to 690V, 3-phase	
	Rated frequency, f_n	50…60 Hz	
	Rated insulation voltage, U_i	1000V, 3-phase	
Rated Currents	Continuous current rating, I_e	Horizontal bus - up to 4000 A	Vertical bus - up to 1200 A per column(3)
	Short circuit peak withstand, I_{pk}	Horizontal and vertical buses - up to 210 kA	
	Short time withstand rating, I_{cw}	Horizontal and vertical buses - up to 100 kA for 1 second	
	Neutral (N)	Full or half-rated	
Creepage Distances and Clearances	Rated impulse withstand voltage, U_{imp}	6, 8, or 12 kV	
	Material group (overvoltage category)	IIIa (175 </= CTI < 400)	
	Pollution degree	3	
Bus Material and Plating	Horizontal power bus	Copper (optional tin plating)	
	Vertical distribution bus	Copper with tin plating	
	Protective earth conductor (PE)	Copper (optional tin plating)	
Degrees of Protection	IEC 60529	IP20, IP42, or IP54	
Forms of Separation	IEC 61439-1	Form 2b, 3b, or 4b	
Column Dimensions	Height	See page 14	
	Width		
	Depth		
Units	Module size	80 mm high x 500 mm wide = 1 module	
	Modules per column, max	24 (23 for high density)	
	Withdrawable unit sizes	1, 2, 4, 6, 8, 10, 12 modules	
Structural Surface Treatments	Interior	G90 galvanized metal (1)	
	Exterior	RAL 7032 Pebble Grey paint or Munsell 6.5 paint (additional colors available by request)	
Environment	Storage temperature	-25…55 °C	
	Operating (ambient) temperature	-5…40 °C(2) with up to 95% non-condensing humidity	
	Altitude	Up to 1000 m without derating: derated after 1000 m	

(1) Interior painted surfaces available as custom paint requests.
(2) The average temperature over a 24-hour period must not exceed 35 °C.
(3) Up to 600 A top and bottom, effective 1200 A per column.

Nameplate Data

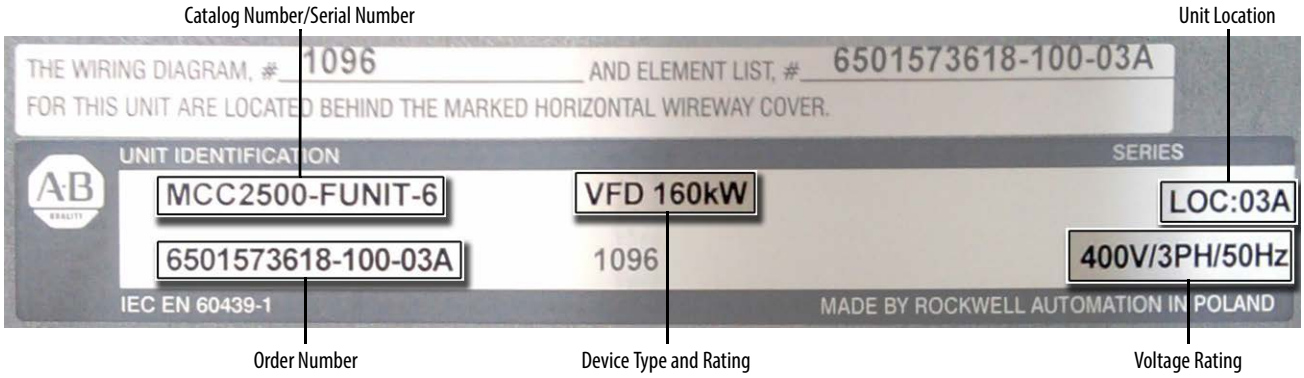
In compliance with EN 61439-1, each CENTERLINE 2500 MCC column is supplied with a nameplate on the enclosure or vertical wireway door.

Figure 6 - Column Nameplate



Each unit also has an identification label. On withdrawable units, the unit identification label is on the interior of the bottom plate of the unit. On fixed units, the unit identification label is on the interior right side plate.

Figure 7 - Unit Identification Label



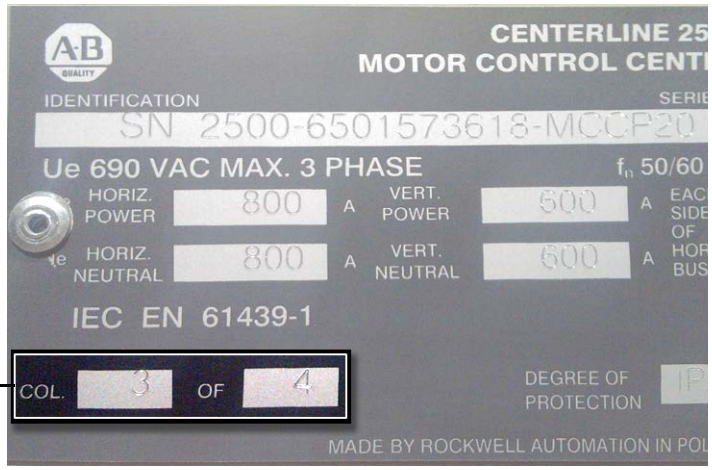
TIP The catalog number or serial number and series letter are required to properly identify the equipment to sales or factory personnel.

Motor Control Center Sequence Numbering

IMPORTANT CENTERLINE 2500 MCCs are designed so functionality is not affected by the column numbering sequence. However, **we recommend that columns be installed in sequential order**.

Each CENTERLINE 2500 MCC column nameplate identifies column sequence numbering, for example, MCC column 1 of 1 or 1 of 5.

Figure 8 - Column Nameplates



Identifies Column Sequence Numbering

Columns are numbered to match factory-supplied MCC elevation drawings. Numbering each column helps installers and users easily identify MCC columns and units. If there are questions about column numbering during field installation, inspection, or operation, the following instructions can provide guidance.

IMPORTANT Leftmost column must be installed in the proper location for the bus to splice. (Both ends of double-front MCCs must be installed as ends for splicing.)

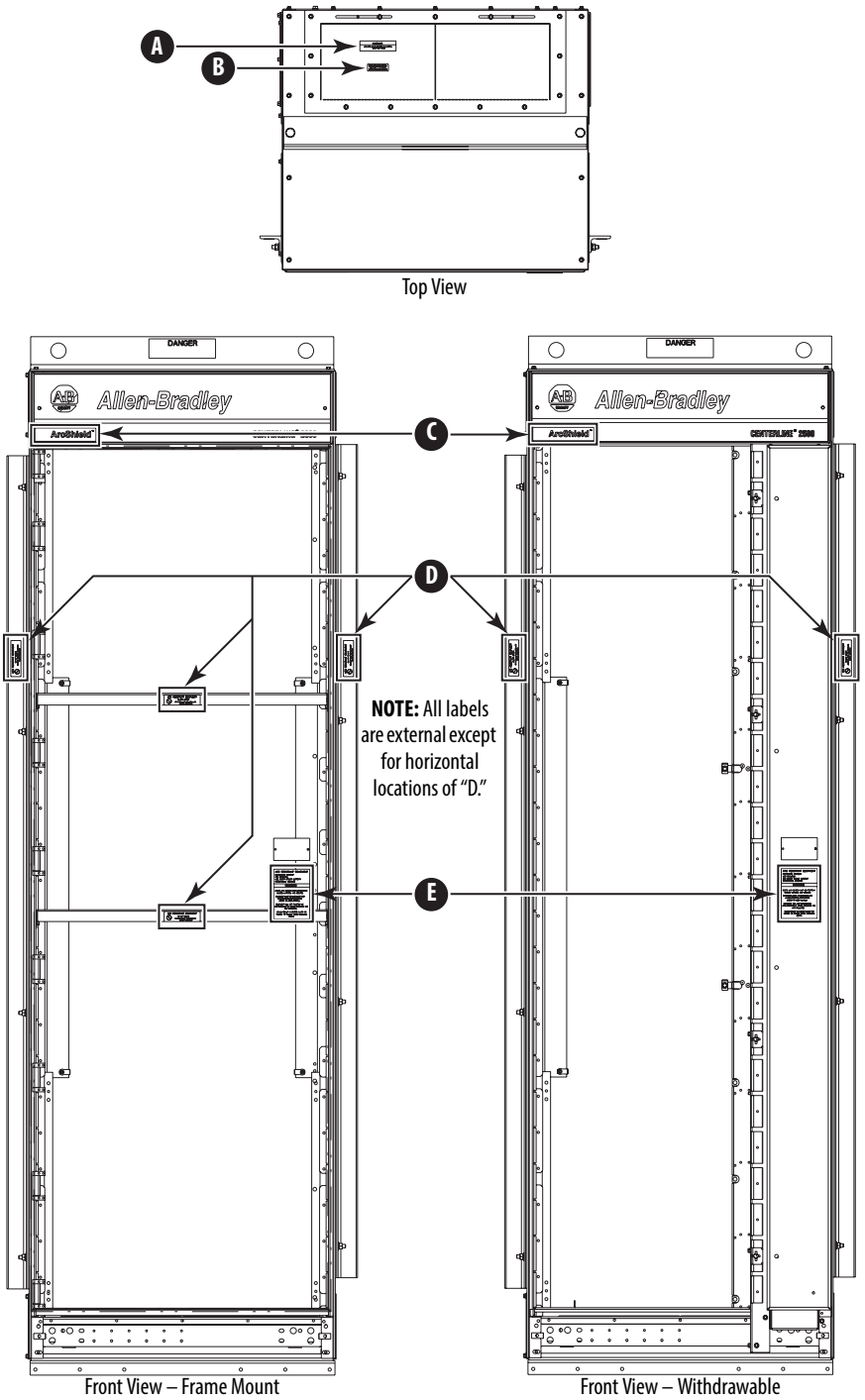
The most important criteria for additions of columns to existing MCCs is matching the horizontal bus, enclosure type, and network capabilities for the complete MCC line up. The voltage, current rating, short circuit withstand, and IP rating for all columns must be consistent.

ArcShield Labels

MCC columns with arc proof assembly have a rating label (Detail E in Figure 9) below the nameplate. There are also labels on other parts that must be in place before operating a MCC with ArcShield; see Figure 9.

CENTERLINE 2500 MCCs with ArcShield have a back-corner baffle at the end of each lineup and insulation on the center side closing-plate at the end of the lineup; see Figure 4 on page 16 for more details. They also have external vertical support angles at each end of the lineup.

Figure 9 - ArcShield Label Locations



ARC RESISTANT EQUIPMENT
WARNING
HOT GASES MAY BE EXHAUSTED IF AN INTERNAL ARCING FAULT OCCURS

Detail A

DO NOT MODIFY PLATE OR INSTALL CABLE/CONDUIT IN THIS LOCATION.

PLATE MUST REMAIN UNOBSTRUCTED.

Detail B

ArcShield™

Detail C

ARC RESISTANT EQUIPMENT
DO NOT REMOVE
BRACKET MUST BE INSTALLED DURING OPERATION

Detail D

ARC PROOF ASSEMBLY
PERSONAL AND ASSEMBLY PROTECTION UNDER ARCING CONDITIONS PER IEC/TR 61641:2008

PROSPECTIVE CURRENT, $I_{p\ arc}$ ≤ 65 kA
ARC DURATION, t_{arc} ≤ 300 ms
OPERATIONAL VOLTAGE, U_e ≤ 480 V

WARNING

DOORS AND COVERS MUST BE PROPERLY CLOSED, LATCHED, AND SECURED. REFER TO PUBLICATION 2500-IN001.

ASSEMBLY MUST BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

ASSEMBLY WILL NOT FUNCTION AS ARC PROOF IF ABOVE GUIDELINES ARE NOT FOLLOWED.

FAILURE TO FOLLOW THESE GUIDELINES COULD RESULT IN SEVERE INJURY OR DEATH.

41006-403-01 (1)

Detail E

Receiving, Handling, and Storage

Refer to Receiving, Handling and Storing CENTERLINE 2500 Motor Control Centers Instructions, publication 2500-IN002, for additional instructions. This publication is shipped with each MCC, attached to the outside of the MCC within the layer of clear poly wrap.

ATTENTION: To avoid personal injury or structural damage, never attempt to lift or move the motor control center by any means other than the methods outlined in the Receiving, Handling and Storing CENTERLINE 2500 Motor Control Centers Instructions, publication 2500-IN002. Motor control centers are top and front heavy.

Receiving

CENTERLINE 2500 MCCs are shipped upright as one or two column shipping blocks or two or four double front column shipping blocks. Each CENTERLINE 2500 MCC shipping block is provided with a lifting angle. Each column in a shipping block is bolted to the shipping skid with removable shipping angles and covered with clear plastic wrap. Protection is for upright shipping and is not waterproof or watertight. Equipment that extends from the structures is also protected.

Heavy duty/export packaging is similar to standard packaging, but uses a poly wrap suitable for occasional water-spray. In addition, wood framing and sheeting surround the columns. Heavy duty/export packaging is not watertight, waterproof, or intended for long-term storage.

Upon delivery of the MCC, refer to the packing slip shipped with your MCC for sizes and exact shipping weights, as well as the shipment for lost or damaged items. If lost or damaged items are detected, refer to the steps described in publication 2500-IN002.

Handling

The following are acceptable methods of handling MCC columns within the receiving facility. These methods are described in publication 2500-IN002.

- Use of a forklift
- Overhead lifting (crane or hoist)
- Sling lifting

MCC columns must be handled in the upright vertical position. Failure to comply with this method can lead to busbar, unit, and enclosure damage.

The MCC must remain bolted to the shipping skid until delivered to its final installation area.

ATTENTION: MCCs are top and front heavy. To avoid personal injury or structural damage, never attempt to lift or move the MCC by any means other than the methods outlined in Receiving, Handling and Storing Motor Control Centers, publication 2100-IN040.

Storage

CENTERLINE 2500 MCCs, units and related equipment must be stored in a clean, dry environment with ambient temperatures ranging from -25...55 °C (-13...131 °F). For short periods, not exceeding 24 hours, temperatures of up to 70 °C (158 °F) are allowed. Take care to help prevent damage from exposure to excessive humidity, vibration, and shock.

Store MCCs with the plastic covering in place to prevent dirt and dust from entering the structure. Check periodically for condensation build up and, if necessary, install space heaters. Contact your Rockwell Automation representative for ordering information.

Install Columns

Location Planning

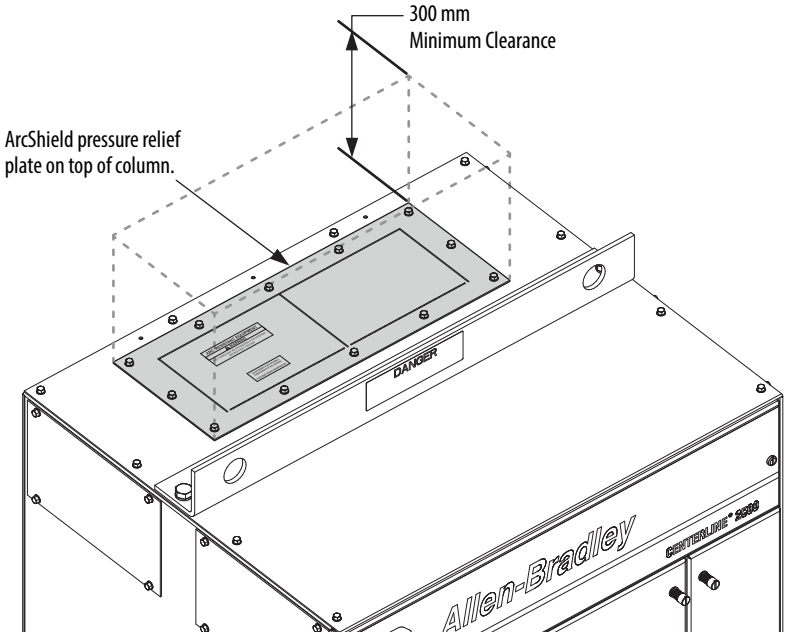
When planning the location for your CENTERLINE 2500 MCC, consider:

- Cable entry and exit points
- Busways
- Overall height of installation area
- Alignment with other equipment
- Future needs
- Environment

The area must be level and the environment must be compatible with the degree of protection provided by the enclosure.

ArcShield Clearance Space

You need a minimum 300 mm of clearance space above the MCC. This space is needed to vent the pressure relief plates in case of an arc flash.



ATTENTION: Do not step on pressure relief plate. Stepping on plate could cause it to not work properly during arc flash.

Environment

CENTERLINE 2500 MCCs are designed to operate under the service conditions described in IEC 61439-1. Be aware that variations in temperature and relative humidity could potentially cause occasional condensation.

Temperature

When operating an MCC, ambient air temperature must remain in the range of -5...40 °C. The average temperature over a 24-hour period must not exceed 35 °C.

Humidity

Non-condensing humidity is permissible up to 95% at the maximum temperature of 40 °C, with the average temperature not exceeding 35 °C over a 24-hour period.

Altitude

The CENTERLINE 2500 MCC is designed to operate at installation sites at altitudes up to 1000 m above sea level without derating. If the altitude at your installation site exceeds 1000 m above sea level, contact your Rockwell Automation representative for derating information.

Pollution Degree

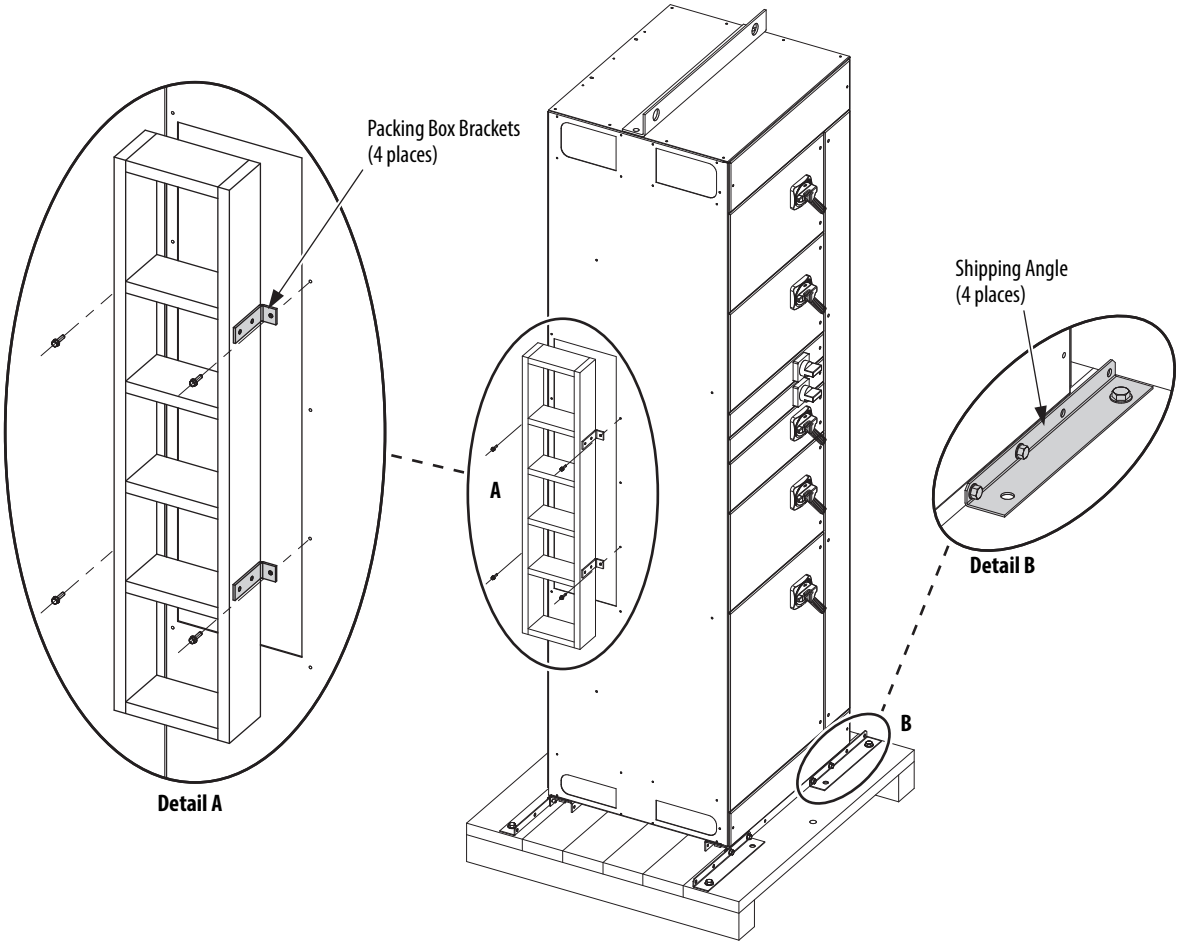
CENTERLINE 2500 MCCs are designed for use in a pollution degree 3 environment. IEC 61439-1 defines pollution degree 3 as, “conductive pollution occurs or dry, non-conductive pollution occurs that become conductive due to condensation.”

Remove Packing Materials

When the MCC has been delivered to the site of installation, remove the packaging material. Save any manuals and data sheets for future reference.

ATTENTION: To avoid personal injury, use caution when the motor control center is not secured. Motor control centers are top and front heavy.

1. Remove the packing box around the horizontal bus if present and remove the four brackets as shown (Detail A).



2. Remove the bolts securing each shipping angle (Detail B) from the shipping skid.

ATTENTION: Once the bolts are removed from the shipping angles, the MCC is no longer secured on the skid.

3. Remove the shipping angles from the MCC.

   You can now remove the MCC from the shipping skid.

Locating Bus Splice Kits

Power bus splice kits, if required, are within a wireway or blank unit space. A fluorescent pink, removable label (on the outside of the column) designates the location. PE splice kits are in the bottom horizontal wireway, fastened to the horizontal PE conductor.

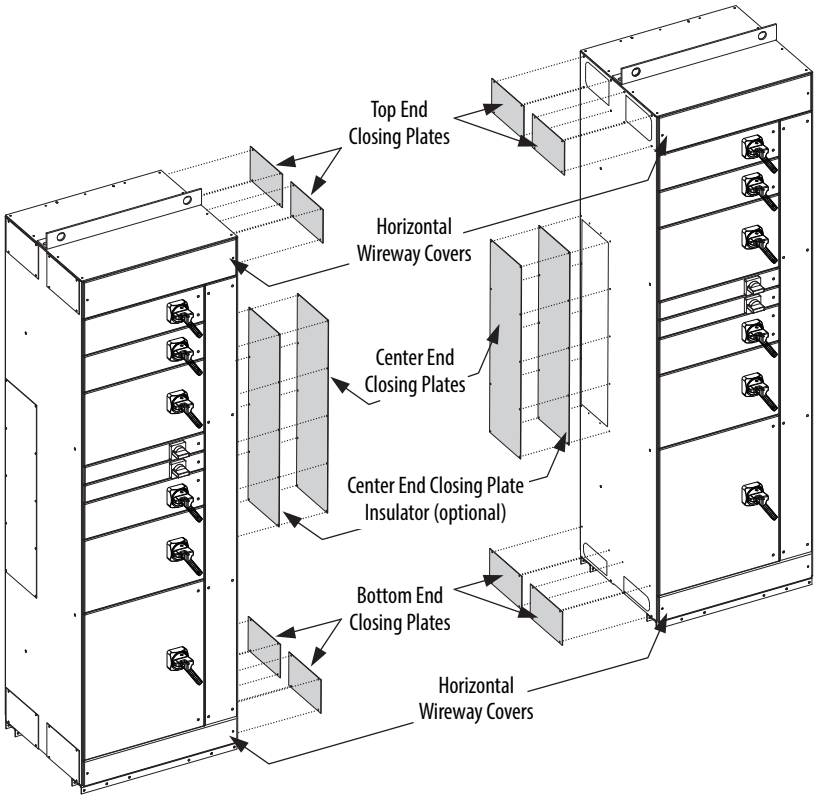
Locate the splice kits and set aside for later use.

Figure 10 - Splice Kit Label

Removing the Covers

Follow these procedures for removing the covers on the MCC.

1. Remove the top and bottom horizontal wireway covers from the MCC.
2. If present, remove the top, bottom, and center end closing plates, on the sides of the two columns that are to be joined.



3. If ArcShield is present, remove the center end closing plate insulators.

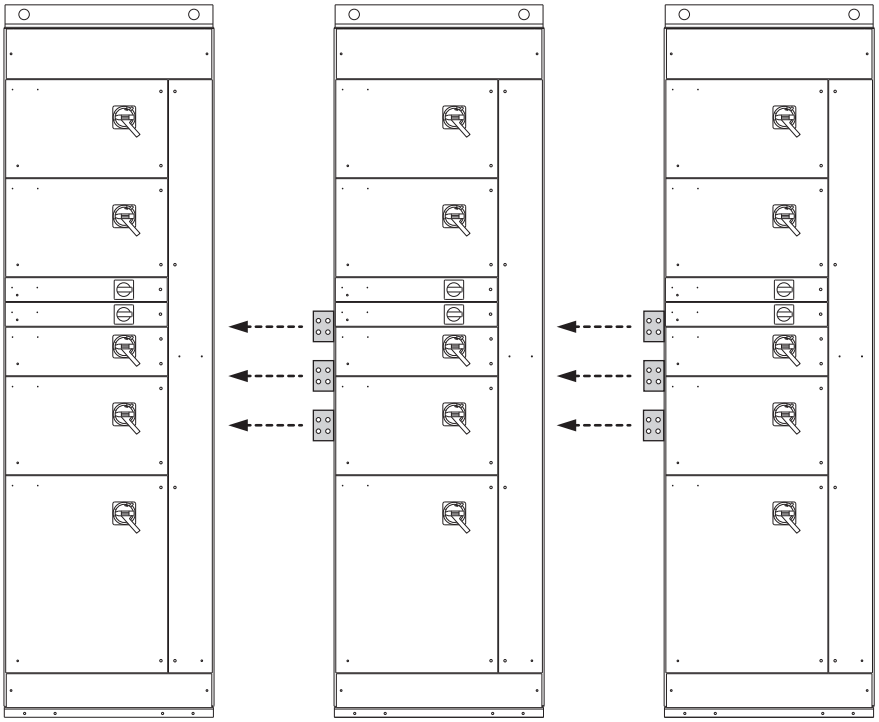
IMPORTANT	When planning MCC cable routing, consider cable replacement in your plans.

For more information, refer to Chapter 4.

Positioning the Motor Control Center

Follow these procedures for positioning your MCC.

1. Documentation packages shipped with assembled MCCs include an MCC elevation drawing with a floor plan layout. Locate and use this floor plan layout for positioning your MCC columns.
2. Identify the leftmost column.



TIP The horizontal power bus does not extend past the leftmost MCC column. For sequential columns, the horizontal power bus extends past the MCC.

3. Position the MCC in the location where it is to be installed.

IMPORTANT The floor surface must be level.

4. Depending on the installation site, begin with the leftmost or right-most column and install one shipping block at a time.

   Refer to Receiving, Handling and Storing CENTERLINE 2500 Motor Control Centers Instructions, publication 2500-IN002, for handling guidelines.

Securing a Motor Control Center

Documentation packages shipped with assembled MCCs include an MCC elevation drawing showing an MCC floor plan layout. To secure a column to the foundation, refer to the provided floor plan layout and the following procedures.

Refer to Chapter 4 for cable and conduit routing instructions.

Securing Methods

MCC columns or shipping blocks can be bolted or welded to a foundation. Two mounting channels on the bottom of each MCC column are used for either securing method.

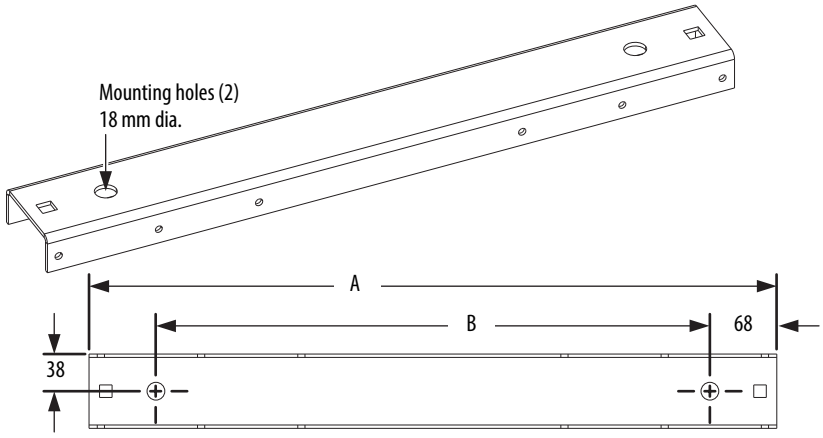
Weld Down Method

See Figure 13 on page 35 for welding a MCC column or shipping block to a foundation.

Bolt Down Method

The two mounting channels allow up to four steel M12 bolts (minimum Property Class 8.8) for each MCC column. We recommend that these bolts be pre-located and embedded in the foundation before installing each MCC column. See page 31 through page 33 for mounting bolt locations.

Figure 11 - Mounting Channel Dimensions and Bolt Locations



All dimensions are mm.

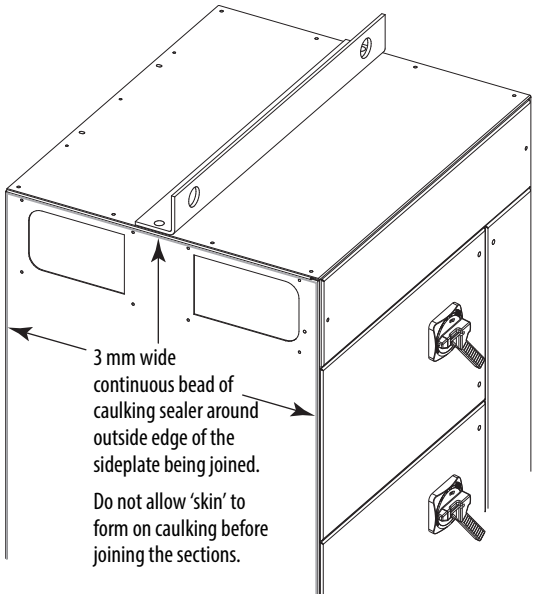
MCC Column Width	A	B
600	597	461
700	697	561
800	797	661
900	897	761
1000	997	861

TIP Mounting channel is not flush with the sides of the MCC column.

Sealing IP54 Enclosures Before Securing

TIP The following steps do not apply to IP20 or IP42 enclosures.

1. Remove the tube of caulking (mastic) sealer from the splice kit and read the application directions on the tube.
2. Cut the nozzle at the first notch, 3 mm from the end.
3. Apply a continuous bead of caulking, 3 mm wide, around the outside edge of the sideplate of the fixed motor control center.



4. Slide the columns together.

   Verify the cabinets are level and joining holes are aligned.
5. If lifting angles are removed from IP54 enclosures, you must seal the lifting angle bolt holes with the caulking sealer.

Securing Single-front, One-column-wide Shipping Blocks

The following instructions are for bolting down the MCC. See Figure 13 on page 35 for weld down requirements.

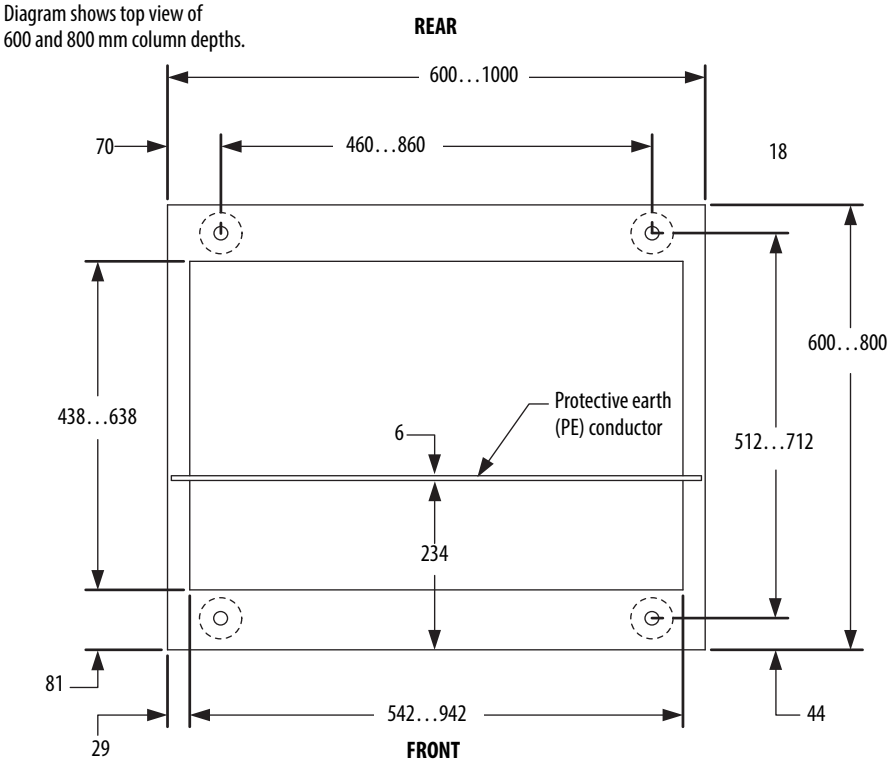
IMPORTANT Verify there is adequate clearance on the sides of columns to access the rear mounting bolt locations.

Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation.

1. Remove the bottom wireway cover to locate the front mounting channel. See Figure 3 on page 15 for cover location.
2. Secure the front of the MCC to the foundation with the mounting dimensions below and the mounting channel requirements on page 29.
3. Replace the bottom wireway cover.
4. Remove the bottom wireway endplate near the back of the unit to locate the rear mounting channel. See Figure 3 on page 15 for endplate location.
5. Secure the rear of the MCC to the foundation with the mounting dimensions below and the mounting channel requirements on page 29.
6. Replace the bottom wireway endplate.

Dimensions are in mm.

Diagram shows top view of 600 and 800 mm column depths.



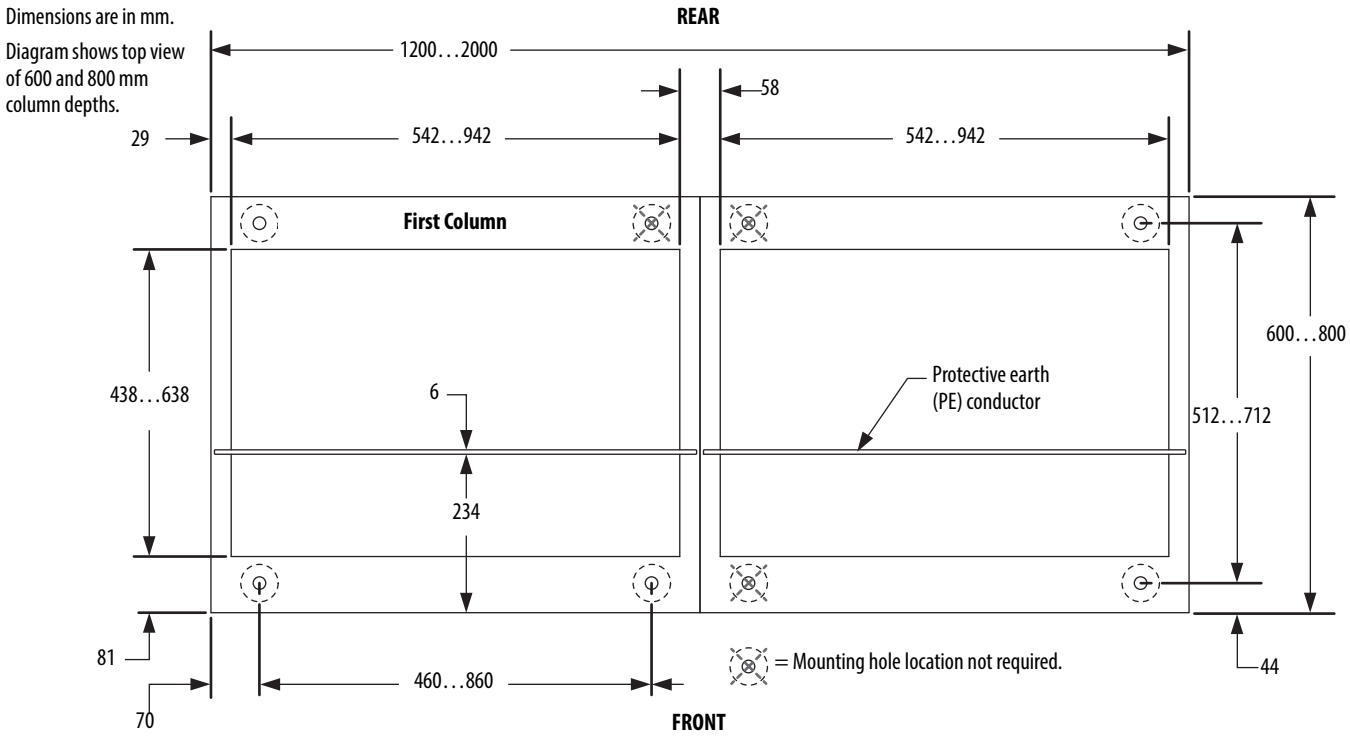
Securing Single-front, Two-column-wide Shipping Blocks

The following instructions are for bolting down the MCC. See Figure 13 on page 35 for weld down requirements.

IMPORTANT Verify there is adequate clearance on the exposed sides of columns to access the rear mounting bolt locations.

Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**.

1. Remove the bottom wireway cover to locate the front mounting channel. See Figure 3 on page 15 for cover location.
2. Secure the front of the MCC to the foundation with the mounting dimensions below and the mounting channel requirements on page 29.
3. Replace the bottom wireway cover.
4. Remove the bottom wireway endplate near the back of the unit to locate the rear mounting channel. See Figure 3 on page 15 for endplate location.
5. Secure the rear of the MCC to the foundation with the mounting dimensions below and the mounting channel requirements on page 29.
6. Replace the bottom wireway endplate.



Securing Double-front, One-column-wide Shipping Blocks

The following instructions are for bolting down the MCC. See Figure 13 on page 35 for weld down requirements.

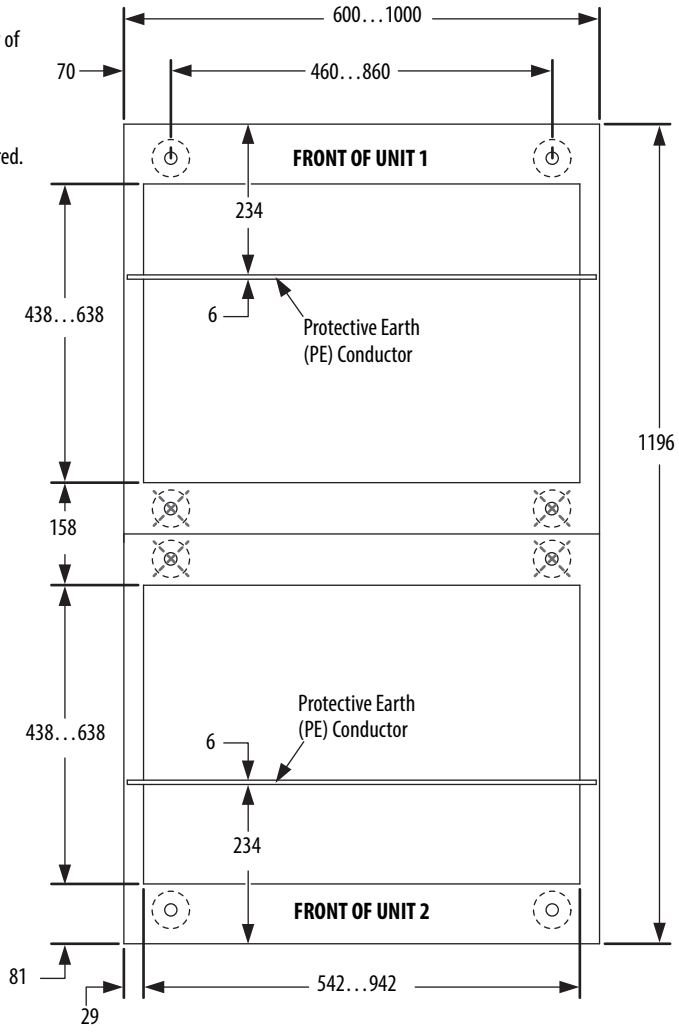
IMPORTANT Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**.

1. Remove the bottom wireway cover to locate the front mounting channel. See Figure 3 on page 15 for cover location.
2. Secure the front of the MCC to the foundation according to the dimensions below and the mounting channel requirements on page 29.
3. Replace the bottom wireway cover.
4. Repeat steps 1 through 3 for the other side of the double-front shipping block.

Dimensions are in mm.

Diagram shows top view of 600 mm column depths.

= Mounting hole location not required.



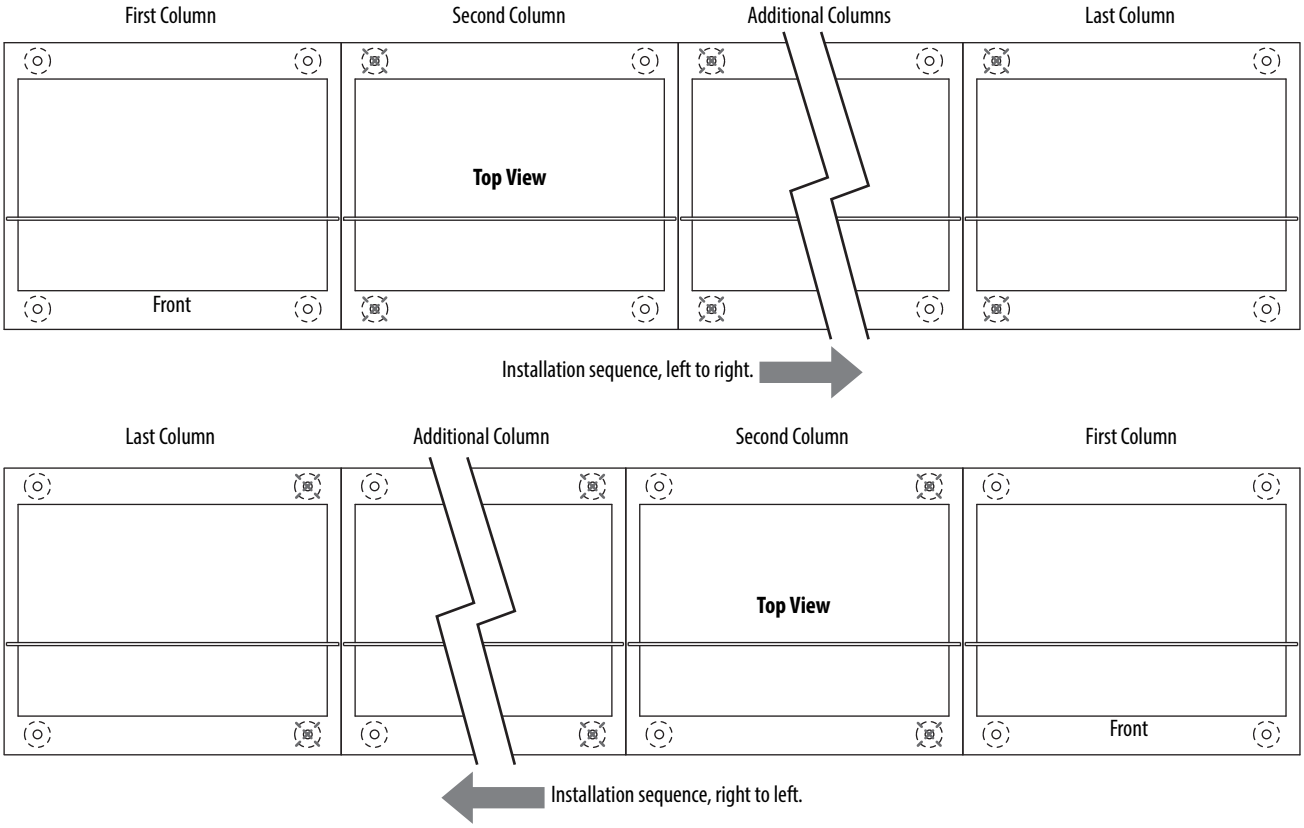
Securing Multiple-column Shipping Blocks

The following figures are for bolting down a multiple-column shipping block. See Figure 14 on page 36 for weld down requirements.

IMPORTANT Verify there is adequate clearance on the exposed sides of columns to access the rear mounting bolt locations.

Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**.

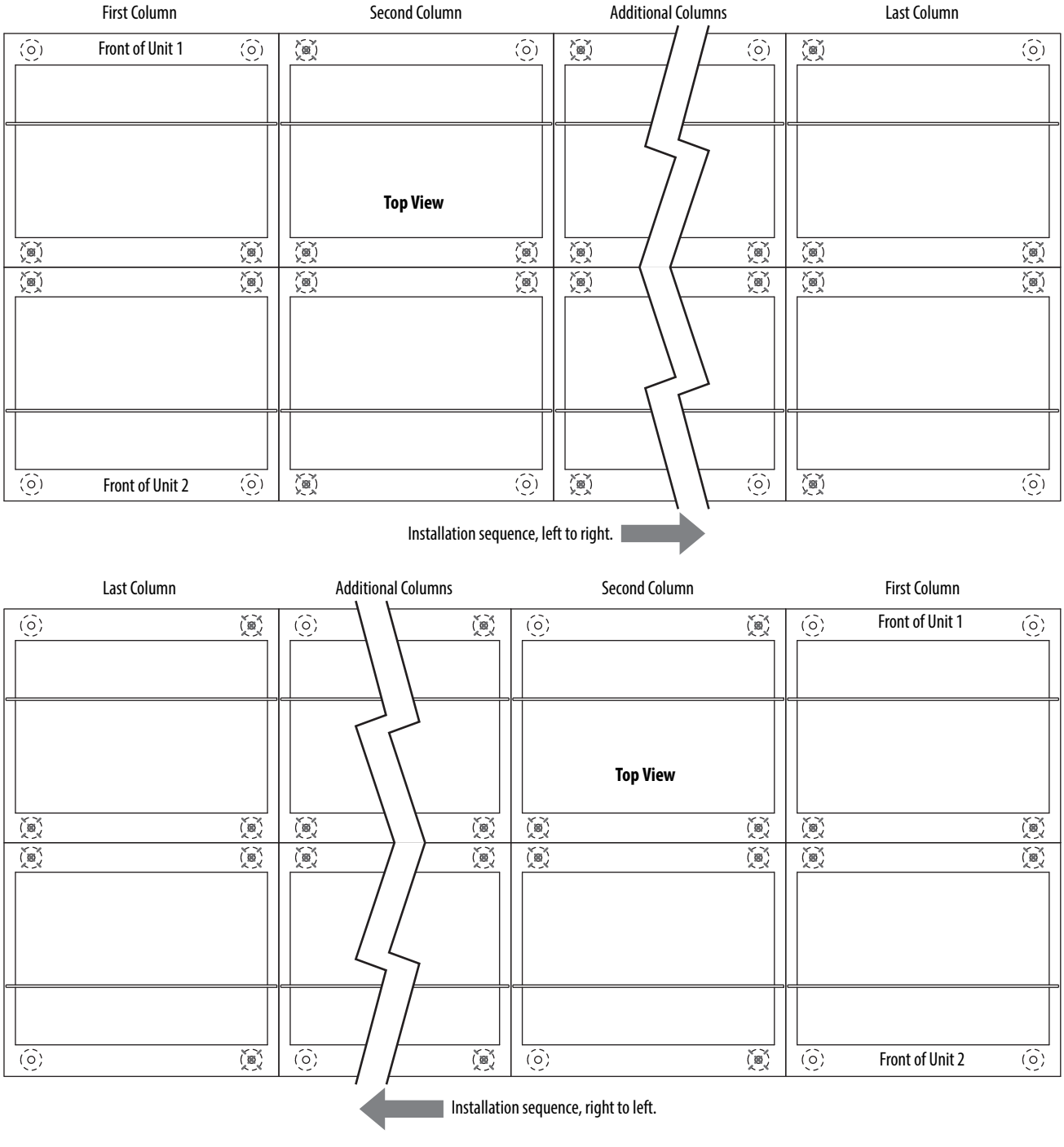
Figure 12 - Bolt-down Requirements for Single-front, Multiple-column-wide Shipping Blocks



ATTENTION: The figure above shows which bolts are required for multiple-column shipping blocks. Drawings with specific dimensions are supplied with each multiple-column shipping block.

Figure 13 - Bolt-down Requirements for Double-front, Multiple-column-wide Shipping Blocks

IMPORTANT Use steel M12 bolts (minimum Property Class 8.8) to secure columns to the foundation. **Not all bolt locations are used**.

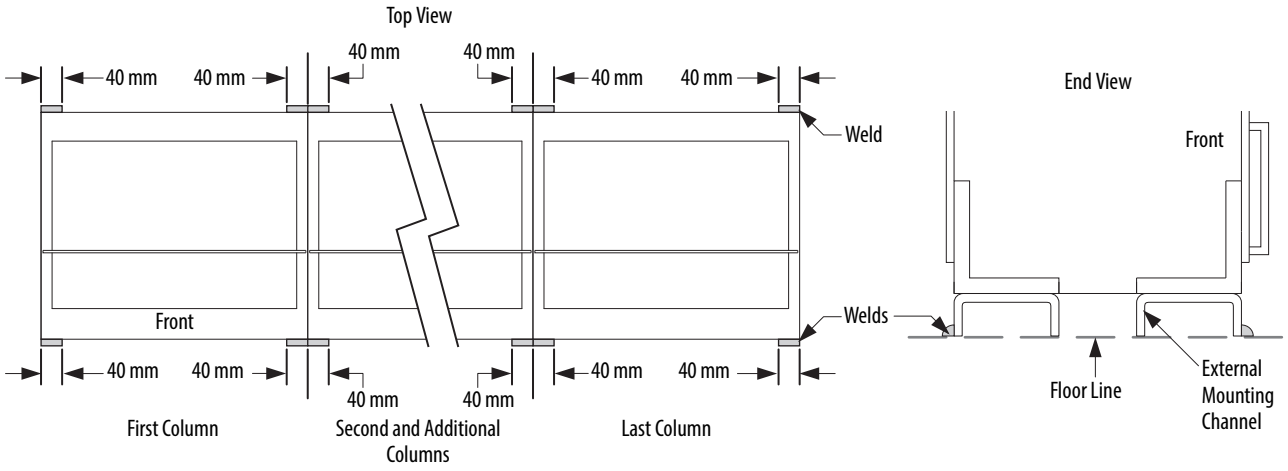


= Mounting hole locations not required.

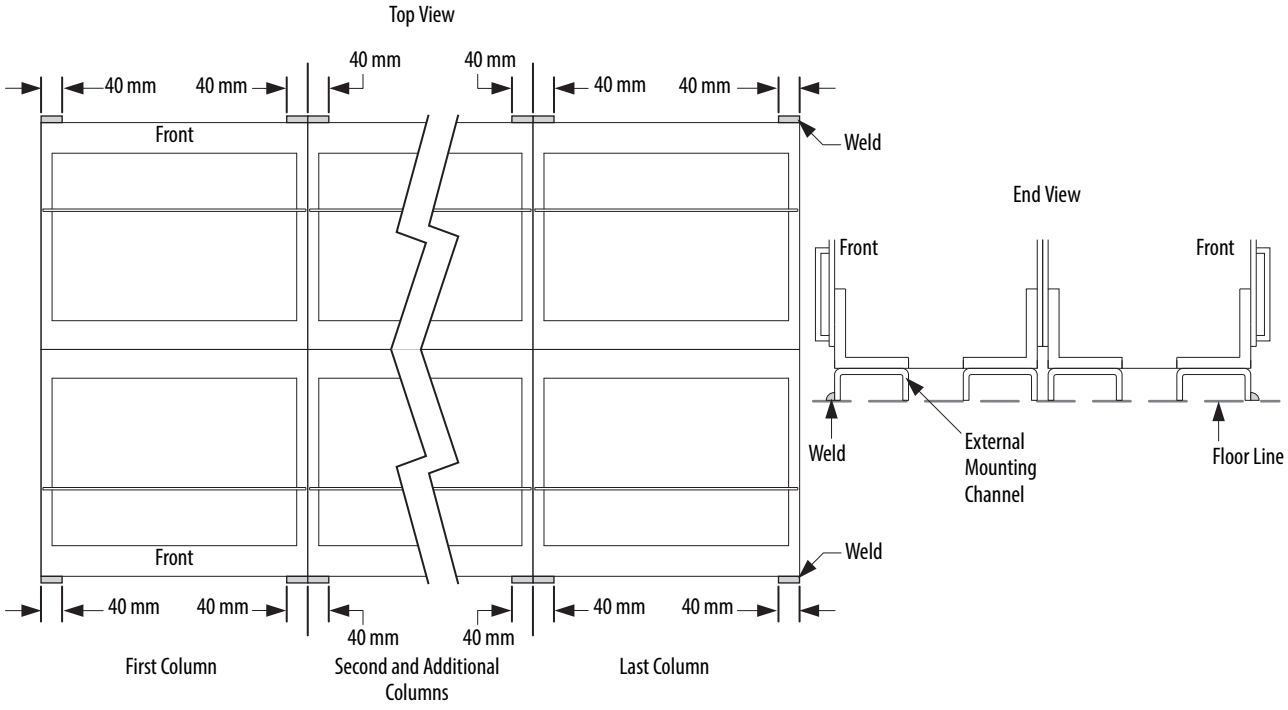
ATTENTION: The figure above shows which bolts are required for multiple-column shipping blocks. Drawings with specific dimensions are supplied with each multiple-column shipping block.

Figure 14 - Weld-down Requirements for Various Configurations

Single-front Configurations



Double-front Configurations



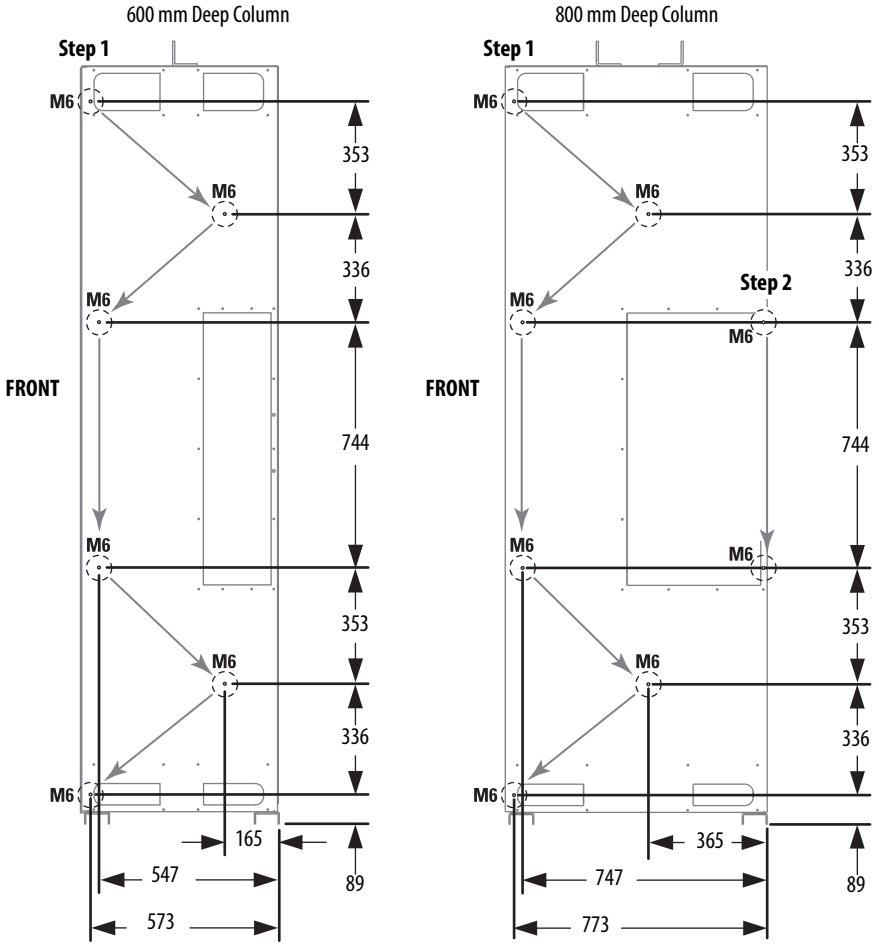
Joining Columns

ATTENTION: Joining columns is done **after** all columns/shipping blocks have been secured to a foundation.

Do not use the hardware to draw columns together.

1. Starting with the first column, use M6 x 1.0 hardware provided in the power bus splice kit to fasten the six joining holes together (step 1 in the figure below).
2. **800 mm deep columns:** use a M6 hex head bolt, washer, and nut provided in the power splice kit to fasten the two joining holes together (step 2 in the figure below).

Dimensions are in mm.



3. Torque all fastened bolts to 5.6 Nm.
4. Inspect the interior for dust and dirt. Vacuum cleaning is recommended.

IMPORTANT Do not clean by using compressed air—it can contain moisture and blow debris into the control equipment.

Seismic Capabilities

Actual CENTERLINE 2500 MCC units have been seismically qualified by dynamic (triaxial multi-frequency testing) seismic tests by using ICC–ES AC156[(1)] acceptance criterion that covers general equipment and supports the seismic certification of electrical systems such as Motor Control Centers (MCCs). The testing was carried out in accordance with ICC–ES AC156 criteria and supports data for the following qualification requirements:

- 2006 and 2009 International Building Code, International Code Council
- 1997 Uniform Building Code, Structural Engineering Design Provisions, Zone 4
- ASCE Standards SEI/ASCE 7-05 and SEI/ASCE 7-10, Minimum Design Loads for Buildings and Other Structures

The range of the ICC–ES AC156 testing enveloped (fulfilled and exceeded) is in the following table.

Test Criteria	S_{DS} (1) (g)	z/h (1)	Horizontal			Vertical			Rp/Ip
			AFLEX (1)	ARIG (1)	AFLEX/ARIG	AFLEX (1)	ARIG (1)	AFLEX/ARIG	
ICC-ES-AC156	1.0	1.0	1.6	1.2	1.33	0.67	0.27	2.5	1.0
ICC-ES-AC156	1.5	1.0	2.4	1.8	1.33	1.005	0.402	2.5	1.0

(1) Equipment is qualified for S_{DS} and z/h values shown. Qualifications can be valid for higher S_{PS} where z/h is less than 1.0.

CENTERLINE 2500 MCC units demonstrated compliance with the following:

- 100% g level of Uniform Building Code 1997 (UBC) Zone 4 (the maximum UBC Zone)
- 100% g level of the International Building Code 2009 (IBC), (SEI/ASCE: $S_{DS} \geq 1.5$ g @ 5 Hz and $S_{D1} \geq 2$ g @ 1 Hz) when subjected to a UBC Zone 4 earthquake or the IBC seismic event

Throughout the seismic testing, the MCC units were under power and operated before, during, and after the seismic tests.

To obtain a IBC or UBC seismic withstandability, each individual CENTERLINE 2500 MCC line-up (including those in double-front applications) must be mounted on an adequate seismic foundation. Installation must be carried out per the anchoring requirements as indicated in this instruction manual. All columns in the MCC line-up must also be bolted together per instructions in Joining Columns on page 37.

In the CENTERLINE 2500 MCC line-up, mounting channels are incorporated in the standard design. As an alternative to bolt down anchoring, these mounting channels can be welded to an adequate seismic foundation. For seismic weld down applications, see Figure 13 on page 35.

(1) *Acceptance Criteria for Seismic Certification by Shake-Table of Non-structural components (AC156)*, International Code of Council Evaluation Service (ICC-ES), October, 2010.

Splicing the Power Bus

ATTENTION: To prevent severe injury or death, de-energize all power sources to the MCC before joining and splicing columns. Follow local codes and guidelines in addition to the requirements of EN 50110.

IMPORTANT When splicing the horizontal power bus, always begin splicing from the lowest phase busbar and work from the bottom up.

IMPORTANT **Using NO-OX-ID** – Do not get any busbar corrosion inhibitor on the bus splicing hardware. It keeps the hardware from being properly torqued and damage can occur.

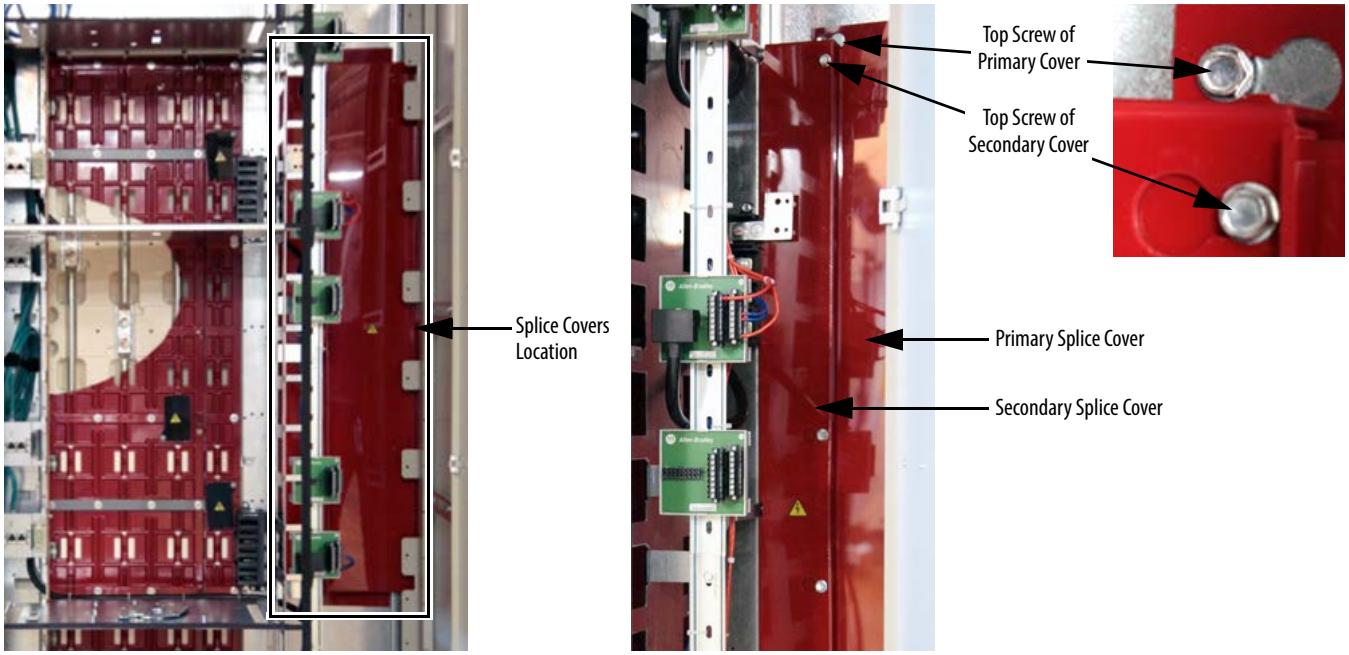
Power bus consists of the main horizontal bus and neutral bus (if present). Based on the current rating of the power bus, the splice kit contains the appropriate splice bars and corresponding hardware. The following procedures describe methods for splicing power buses based on the ampere rating of the busbars.

For additional splicing information related to specific MCCs, refer to the elevation drawing shipped with the MCC in the documentation package.

TIP If necessary, remove units and unit support pans for the appropriate access to splice the power bus.

Accessing the Power Bus

Follow these procedures to access the power bus.



1. To gain access to the horizontal power bus, open the vertical wireway door to the left of the splice.
2. Identify the primary and secondary splice covers as shown.
3. Loosen the top and bottom screws on the secondary splice cover, slide the secondary splice cover to the right, and remove the cover.

   The screws remain in the wireway.
4. Loosen the top and bottom screws on the primary splice cover, slide the primary splice cover to the left, and remove the cover.

   The screws remain in the wireway.

Splicing Power Bus, 800…4000 A

Follow these procedures to splice the power bus.

1. Assemble splice bars and hardware as shown in Figure 15 on page 41.

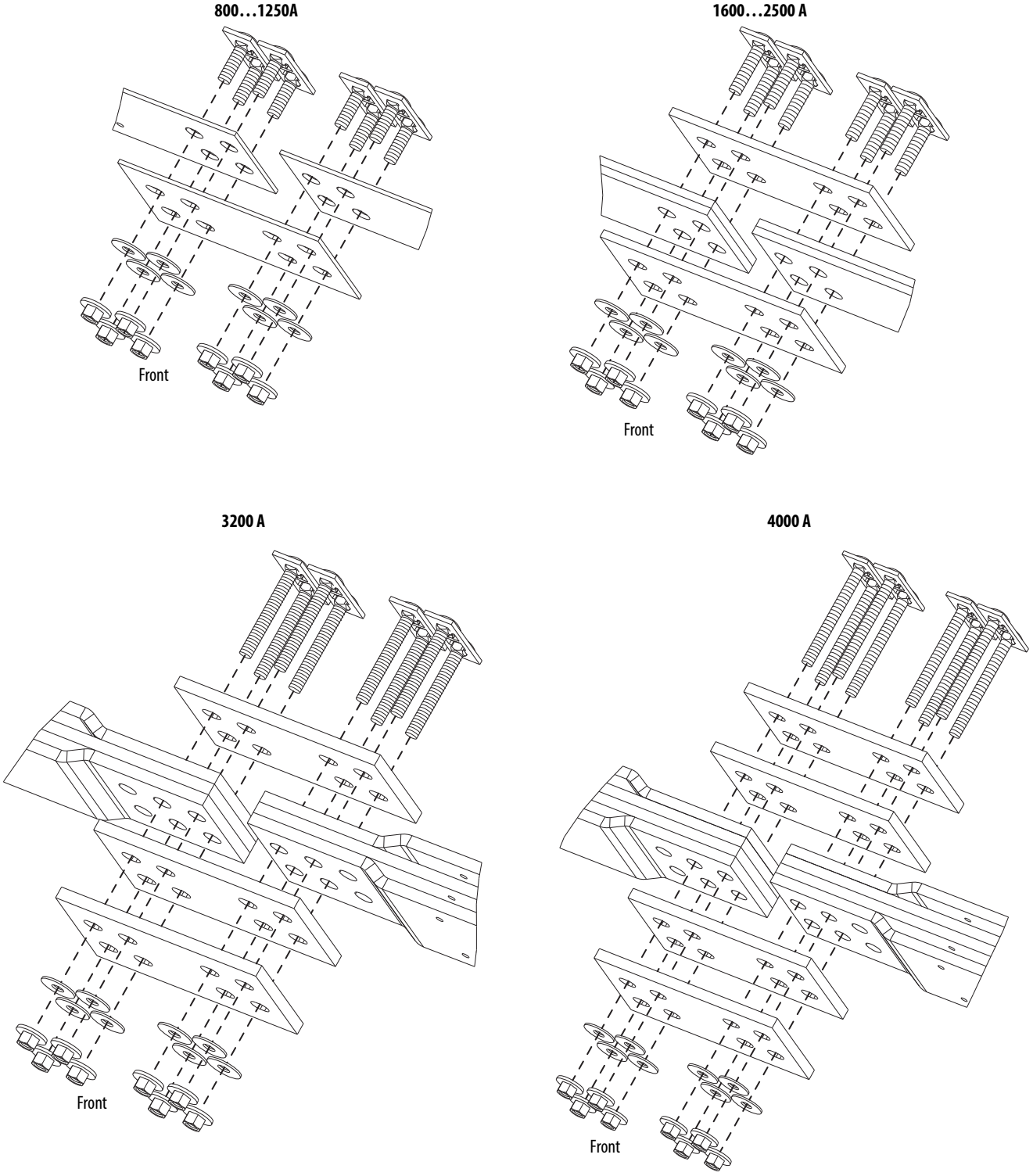
   Repeat for each phase of busbar and, if present, the neutral bar.
2. Tighten hardware to torque specifications.

   See Torque Requirements for Hardware Connections on page 43.

   Do not grease or lubricate hardware.
3. Replace the horizontal bus access covers and check that the bolts and nuts are secure.

4. Replace the units and unit support pans in their respective stations if they were removed.

Figure 15 - Power Bus Splicing Configurations



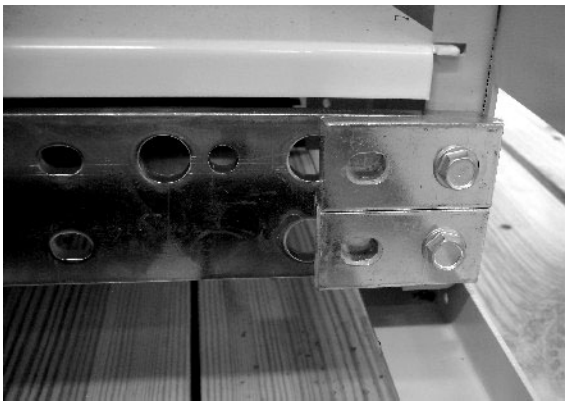
Splicing the Protective Earth (PE) Conductor

The PE conductor is in the bottom horizontal wireway of an MCC column. Up to three PE conductors can be present. To access the PE conductor, remove the bottom horizontal wireway cover.

Follow these procedures to splice the Protective Earth Conductor.

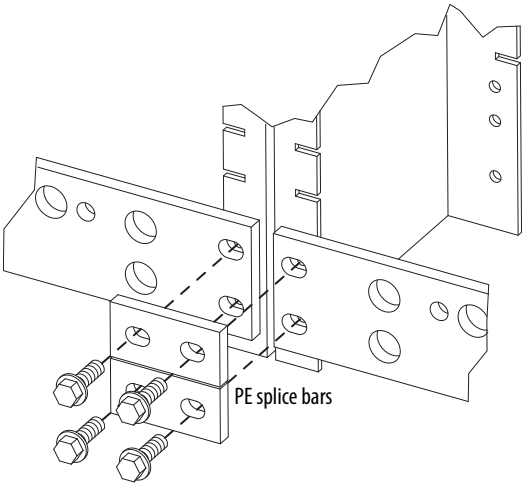
1. Locate the PE splice bars.

   PE splice bars are secured to the end of the horizontal PE during shipping.



Splice bars are attached.

2. Use the PE splice bars to join the horizontal PE of each column and assemble the splice bars and hardware as shown.



3. Tighten hardware to torque specifications. See Torque Specifications on page 43.

   Do not grease or lubricate hardware.

4. Replace horizontal wireway cover and check that bolts are secure.

Control and Network Cables

When finished joining and splicing columns, make sure to connect network and other control cables as required.

Refer to Chapter 9 for IntelliCENTER options.

Torque Specifications

Tighten bus splice connections with a torque wrench according to the table. Torque values can be found on the information label on the interior of the vertical wireway door or on the interior right side plate of fixed units.

Hardware Description	Hardware Size	Torque
Incoming line lug attachment bolts	M12 x 1.75	61 N•m
Horizontal power bus to vertical distribution bus connection(1)	M10 x 1.5	38 N•m
Horizontal power bus splice connection	M10 x 1.5	38 N•m
Protective earth conductor (PE) splice connection	M6 x 1.0	7.3 N•m
Column joining hardware	M6 x 1.0	6.2 N•m
DeviceNet splice cable screws	—	0.55 N•m
I/O terminal blocks	—	0.45 N•m

(1) The factory-made horizontal power bus to vertical distribution bus connections are tightened by a computer-controlled torquing system.

Notes:

Install Cable

When installing cable, make sure it is installed according to appropriate codes and standards. Multi-conductor cables, cable trays, cable ducts, and conduit are all acceptable methods of routing cable to your MCC.

It is important that all cable is installed so it is compatible with the enclosure rating of the MCC. Cable entry and exit points must be properly sealed so water and moisture cannot enter or accumulate inside the enclosure.

Inside the MCC enclosure, route cable away from the PE conductor to avoid damage. Position cable so bending is minimized and relative vertical alignment to incoming connections is maintained.

Refer to the documentation package shipped with your MCC for the following information:

- Approximate cable entry locations
- Space availability for incoming cables
- PE conductor locations
- Wiring schemes for main fusible disconnects, main circuit breakers and incoming line compartments

Install cable per manufacturer's instructions and sized according to appropriate codes and standards.

Install ArcShield Protection After Wiring

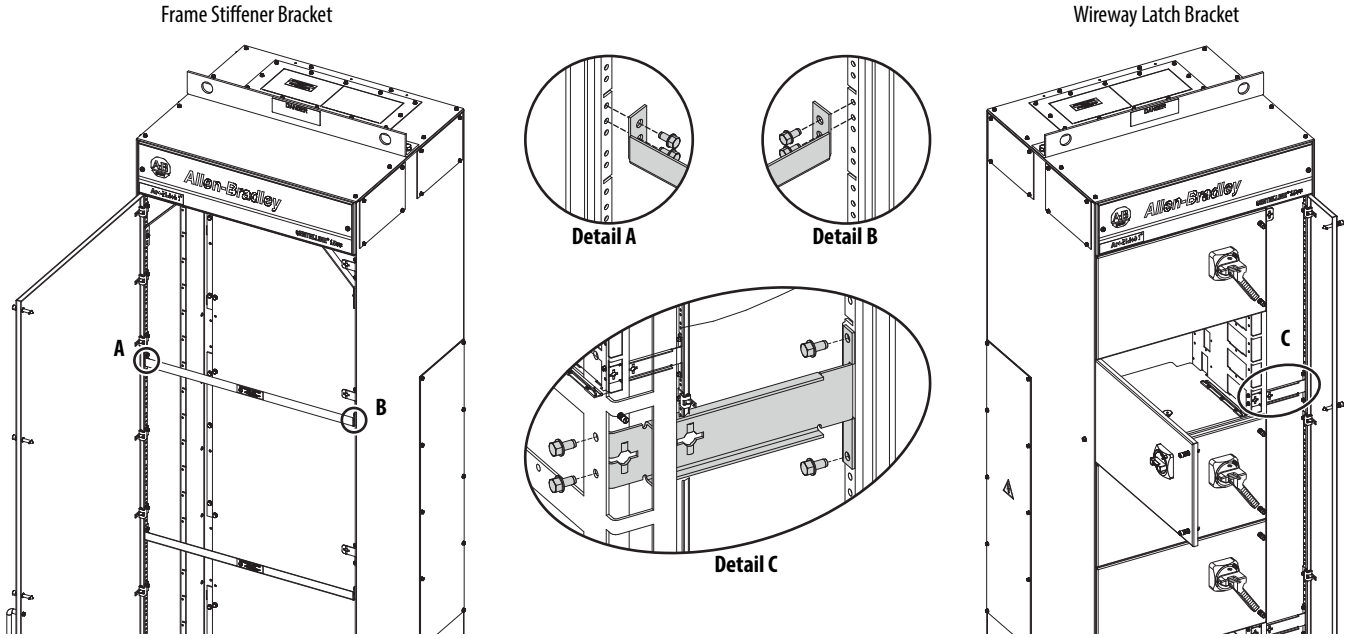
TIP You can temporarily remove ArcShield latch brackets to maker it easier to connect load cables.

Consider removing a unit if you cannot access the screw on the left side of the bracket.

Follow these procedures for installing the door latch bracket/frame stiffener in the wireway.

1. Open door.
2. Install door latch bracket and frame stiffener bracket (if latter was removed).

   Verify latch bracket is in the correct orientation before installing. See Detail C in figure below.
3. Torque all bracket screws to 3.6 N•m (32 lb•in).



Lugs

IMPORTANT Install lugs so proper spacing is used between phases. Hardware must be tightened per the torque specifications.

Refer to Chapter 3 for more information.

Verify the compatibility of wire size, type, and stranding for the power lugs furnished. Use correct lugs in all applications. Crimp compression lugs with manufacturer recommended tools.

TIP Use the MCC electrical schematics and wiring diagrams to verify field wiring connection points.

Incoming Line Lug Compartment

Top or bottom incoming line lug compartments are available. Base the lug selection on the size, number and type of conductor.

The following are guidelines for selecting lugs based on incoming line available short circuit current, I_{sc}.

$I_{sc} \leq$ 50,000 amperes RMS symmetrical use **mechanical screw** or **crimp/compression** type lugs.

I_{sc} > 50,000 amperes RMS symmetrical **crimp/compression** type lugs are recommended.

Main Disconnecting Means

Refer to the documentation package shipped with your MCC for information on incoming terminations.

For main disconnects or circuit breakers, use the lugs provided.

Cable Bracing

The CENTERLINE 2500 MCC bus work system has been tested and is qualified to withstand forces that exceed the short circuit withstand ratings for the MCC. Incoming line cables and outgoing feeder cables also need to be supported to withstand the same short circuit forces. Follow appropriate codes and standards when bracing incoming and outgoing cables.

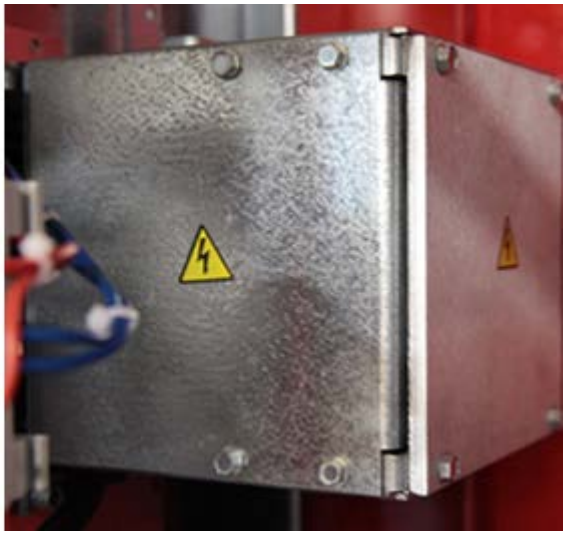
There are many sizes and types of cables, as well as different means by which the cables can be supported. Cabling needs to be secured or braced for the weight of the cable and in case of a fault.

Follow the guidelines addressed in IEC Standard 60364-5-52.

Secure Load Wires

Standard internal separation within the MCC is IEC 61439-1 Form 3b. IEC 61439-1 Form 4b is available by enclosing terminals for external conductors in a metal box within the vertical wireway.

Form 3b



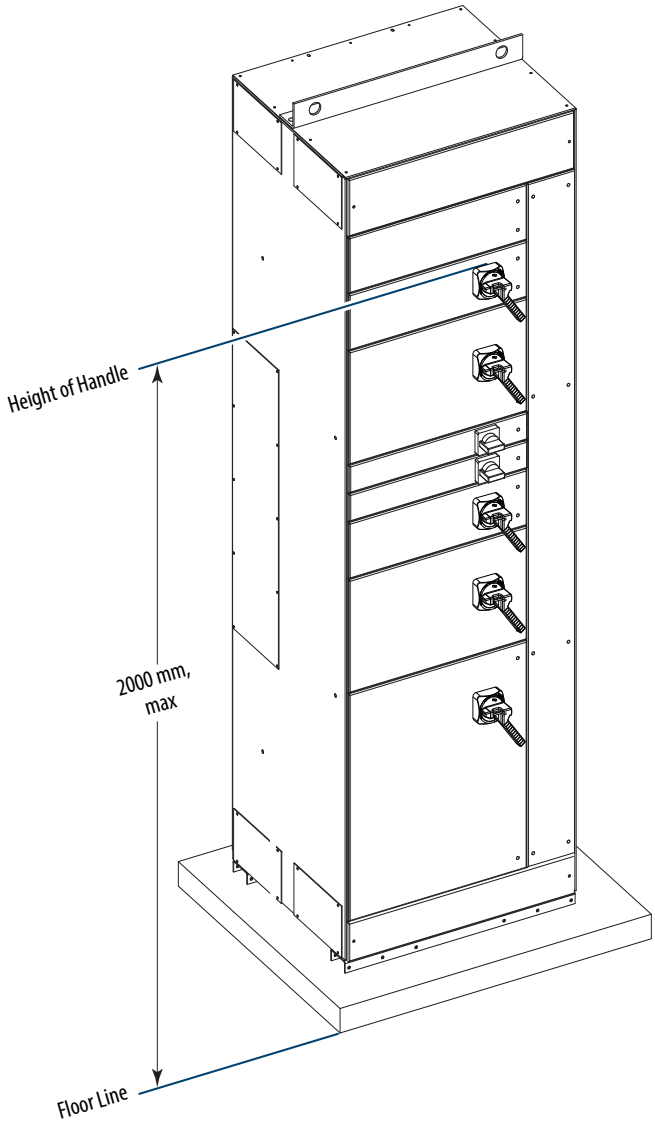
Form 4b

Door Latches, Operator Handles, and Unit Interlocks

Height Considerations

In accordance with EN 61439-1, operating devices (push buttons and handles) should be no more than 2000 mm above floor level. If the MCC is mounted on an elevated surface, the height from the floor to the center of the top handles must be checked for compliance.

Figure 16 - Operator Handle Height

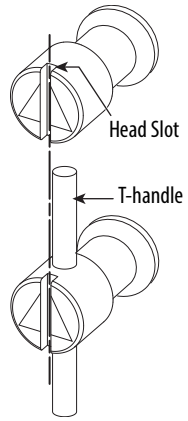


Door Latches

There are two types of door latches available for the 2500 MCC: quarter-turn door latches and ArcShield door latches. Both latches are available with T-handles.

Quarter-turn Door Latches

Latches are provided on each unit door to hold the door closed and isolate the column. You can rotate the door latches by using a standard slotted screwdriver in the head slot.



Latches shown in vertical (closed) position.

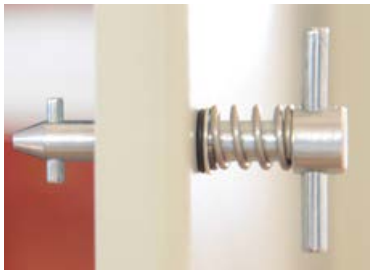
Open the door latches as follows.

1. Rotate each door latch a quarter turn (90°) until its head slot is horizontal.
2. Open the door once all latches are in the open position.

Close and lock the door latches as follows.

1. Close the door.
2. Using a slotted screwdriver, rotate each door latch a quarter turn (90°) until all slots are vertical.

ArcShield Door Latches



ArcShield door latches are spring-loaded to allow pressure relief and keep the doors from detaching from the structure.

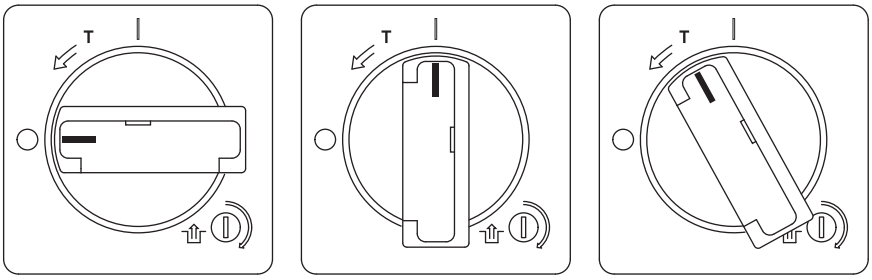
Follow the same procedures in the Quarter-turn Door Latches to open or close a door with ArcShield door latches.

IMPORTANT ArcShield door latches are spring-loaded. When closing a door, push in each latch as you turn it so it locks correctly for ArcShield protection.

Small Rotary-operator Handles

The following is a brief summary of operating instructions for small rotary-operator handles. For additional information, see publication 21-361-950-01, which is available online at http://www.rockwellautomation.com/literature.

Figure 17 - Small Rotary-operator Handle Positions



Handle in OFF/O Position | Handle in ON/I Position | Handle in Tripped/T Position

Opening the Unit Door

1. Turn the small rotary-operator handle to the OFF/O position.
2. Release the door latches.
3. Grasp the small rotary-operator handle and pull the unit door toward you to open.

Closing the Unit Door

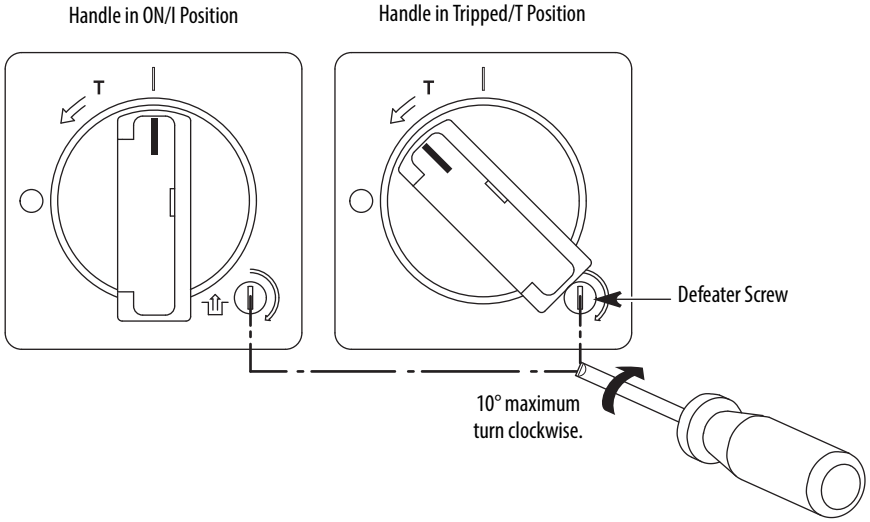
1. Check that the small rotary-operator handle is in the OFF/O position.
2. Close the unit door.
3. Secure the door latches.

Opening the Unit Door in the ON/I Position

ATTENTION: Follow local codes and guidelines in addition to the requirements of EN 50110 when working on energized equipment.

When the unit door is closed and the small rotary-operator handle is in the ON/I or TRIPPED/T position, a defeater screw must be deliberately operated to open the unit door.

1. Release the door latches.
2. Locate the defeater screw on the lower right corner of the small rotary-operator handle.
3. Use a flat blade (number 2) screwdriver to turn the defeater screw 10° (maximum) clockwise.



4. Carefully open the unit door.

Operator Handles for Circuit Breakers

In the event of a circuit breaker fault, the circuit breaker operator handle moves to the TRIPPED/T position. Only reset the circuit breaker after the cause of the fault has been determined and corrected.

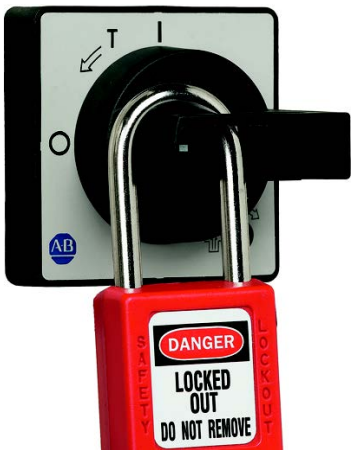
Follow these procedures to reset the circuit breaker.

1. Turn the small rotary-operator handle to the OFF/O position; see Figure 17 on page 51.
2. After the fault has been corrected, verify that it is safe to re-energize the unit and turn the small rotary-operator handle to the ON/I position.

Locking Units in the OFF/O Position

ATTENTION: Follow all company safety and lockout procedures, and local codes when performing this procedure.

Follow these procedures to lock a unit in the OFF/O position.



1. Turn the small rotary-operator handle to the OFF/O position.
2. Push and hold the button on the handle. The lock opening is now visible.
3. Insert and secure the lock.

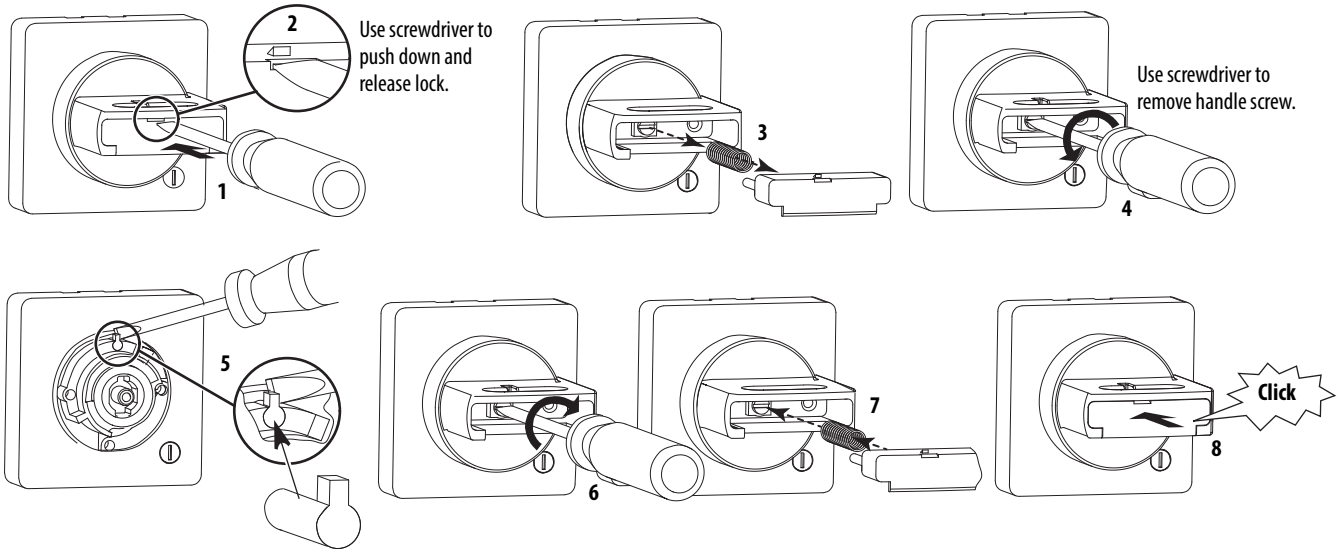
   Up to three 8 mm locks can be inserted.

Locking Units in the ON/I Position

ATTENTION: Locking an operating handle in the ON/I position can conflict with local codes and emergency shutdown requirements.

Locking units in the ON/I position requires user modification. To modify the operator handle to allow locking in the ON/I position, follow the procedure illustrated in Figure 18.

Figure 18 - Modification of the Small Operator Handle to Allow Locking in the ON/I Position

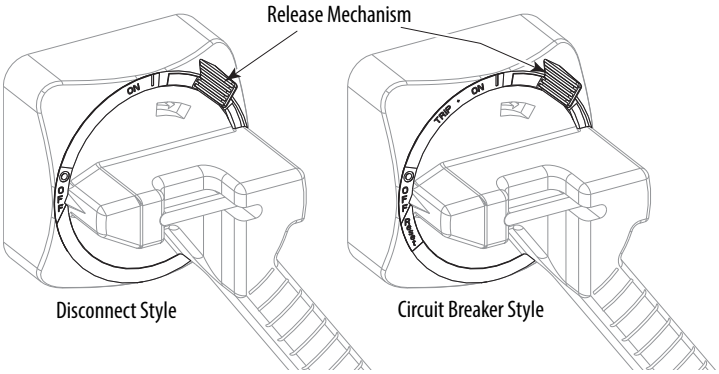


Large Rotary-operator Handles

The following is a brief summary of operating instructions for large rotary-operator handles available for disconnects or circuit breakers.

For additional disconnect handle information, see publication 40053-127-01, which is available online at http://www.rockwellautomation.com/literature.

Figure 19 - Large Rotary-operator Handle Styles



Opening the Unit Door

Follow these procedures for opening the unit door.

1. Verify the large rotary-operator handle is in the OFF/O position.
2. Release the door latches.
3. Hold the large rotary-operator handle in the OFF/O position while pushing the release mechanism down.
4. Carefully open the unit door.

Closing the Unit Door

1. Verify the large rotary-operator handle is in the OFF/O position.
2. Slowly close the door until contact with the large rotary-operator handle is made.
3. Hold the large rotary-operator handle in the OFF/O position while closing.
4. Close the door and secure the door latches.

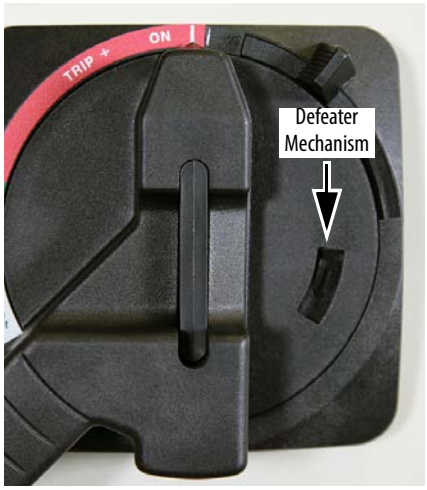
Opening the Unit Door in the ON/I Position

ATTENTION: Follow local codes and guidelines, and the requirements of EN 50110 when working on energized equipment.

When the unit door is closed and the large rotary-operator handle is in the ON/I position, a defeater mechanism must be deliberately operated to open the unit door (for example, to open the door of an energized unit).

Follow these procedures to open a door with the large rotary-operator handle in the ON/I position.

1. Release the door latches.
2. Locate the defeater mechanism on the right side of the handle.
3. Use a flat blade screwdriver to push the defeater mechanism in the direction of the arrow.
4. Carefully open the unit door.



Operator Handles for Circuit Breakers

In the event of a circuit breaker fault, the circuit breaker operator handle moves to the TRIP/+ position. Only reset the circuit breaker after the cause of the fault has been determined and corrected.

Follow these procedures to reset the circuit breaker.

1. Turn the circuit breaker handle from the TRIP/+ position to the OFF/O position.
2. Turn the circuit breaker handle from the OFF/O position to the RESET position.
3. Locate and correct the fault.
4. Verify it is safe to re-energize the unit.
5. Turn the handle from the RESET position to the ON/I position.

Locking Units in the OFF/O Position

ATTENTION: Follow all company safety and lockout procedures, and local codes when performing this procedure.

1. The large rotary-operator handle must be in the OFF/O position.
2. Pull the middle section of the operator handle toward you.

   The lock opening is now visible.
3. Insert and secure the lock.

   Up to three 8 mm locks can be inserted.

Locking Units in the ON/I Position

Locking units in the ON/I position requires user modification.

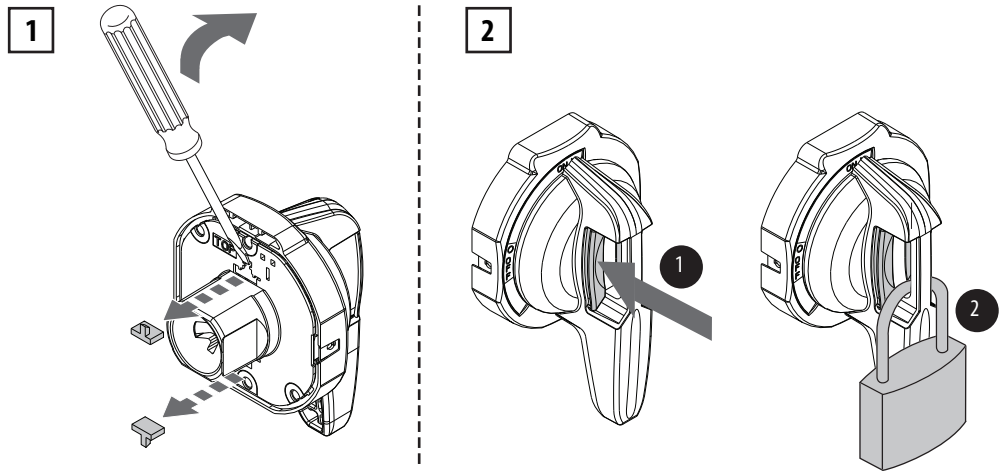
ATTENTION: Locking an operating handle in the ON/I position can conflict with local codes and emergency shutdown requirements.

To modify the operator handle so you can lock it in the ON/I position, you must first remove at least one tab accessible from the handle backside and inside door.

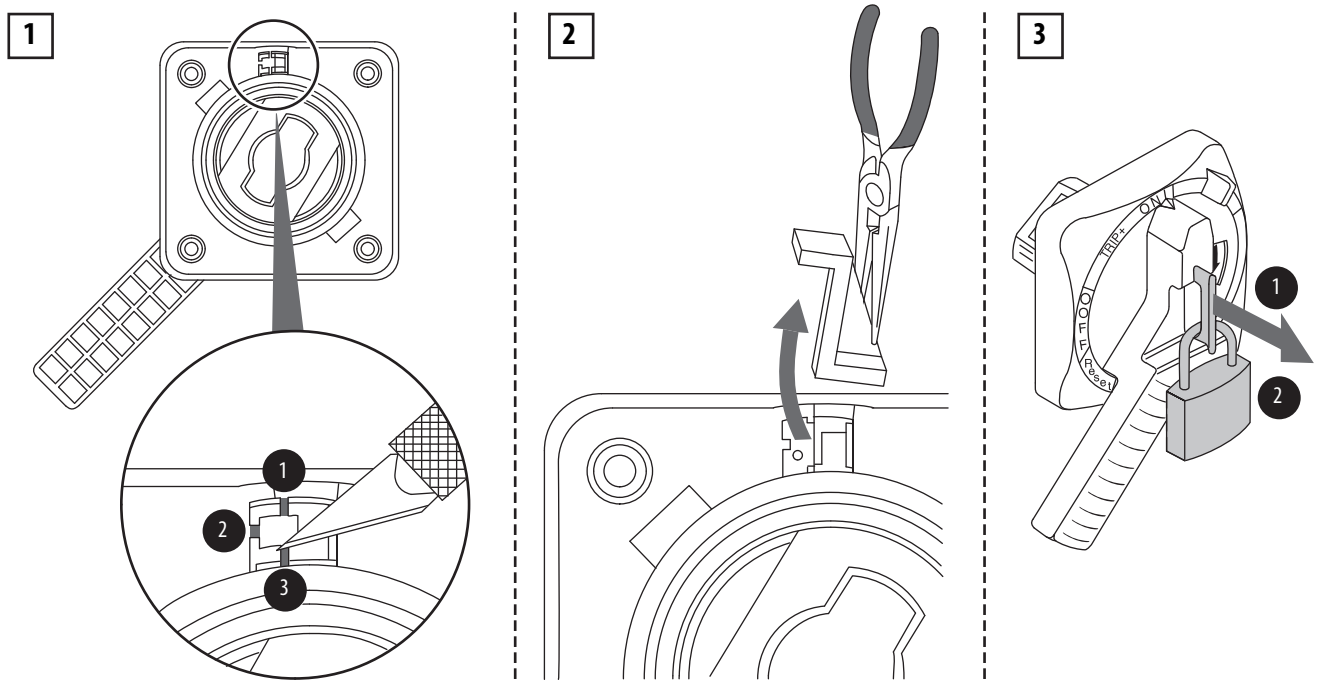
See Figure 20 for the appropriate instructions.

Figure 20 - Locking Rotary Handles in the On/I Position

For Cat. No. 140U-PB and 140U-PY Rotary Handles



For Cat. No. 140U-HM4 and 140U-HM4E Rotary Handles



Unit Interlocks

ATTENTION: Do not attempt to install or remove a unit while the unit main switch is in the ON/I position.

A unit interlock is provided with each plug-in unit. Unit interlocks help prevent units from being removed from or inserted into a column while the operator handle is in the ON/I position.

Install and Remove Units

Unit Size

Unit size is described in terms of modules. One module is 80 mm high by 500 mm wide. Withdrawable units are available is the following sizes: 1, 2, 4, 6, 8, 10, and 12 modules. Fixed units range in size from 4...24 modules.

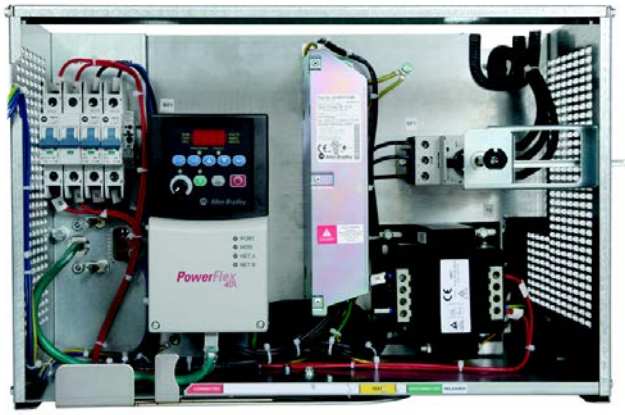
Any unit size above one module must be in even increments. Therefore, you cannot have a unit that is 11 modules high.

CENTERLINE 2500 MCCs are available with many combinations of withdrawable and fixed units. This table lists the maximum ampere rating of each unit size.

Number of Modules	Ampere Rating (max)
1	32 A
2…12	225 A

Figure 21 - Unit Types

One Module Unit



Four Module Unit

Withdrawable Units

Withdrawable units are characterized by withdrawable line, load, control, network, and PE connections. Outgoing load and control connections from these units are made in the vertical wireway. Withdrawable units use a sliding track and a mechanical lever for ease of insertion and removal. Additional features include a separate unit door and optional door mounted pilot devices. The unit door can be closed and latched, providing isolation when the unit is removed. Pilot devices are housed in removable control stations. An optional closing plate is available to help provide isolation if the control station is removed.

Figure 22 - Connections for Multiple Module Withdrawable Units

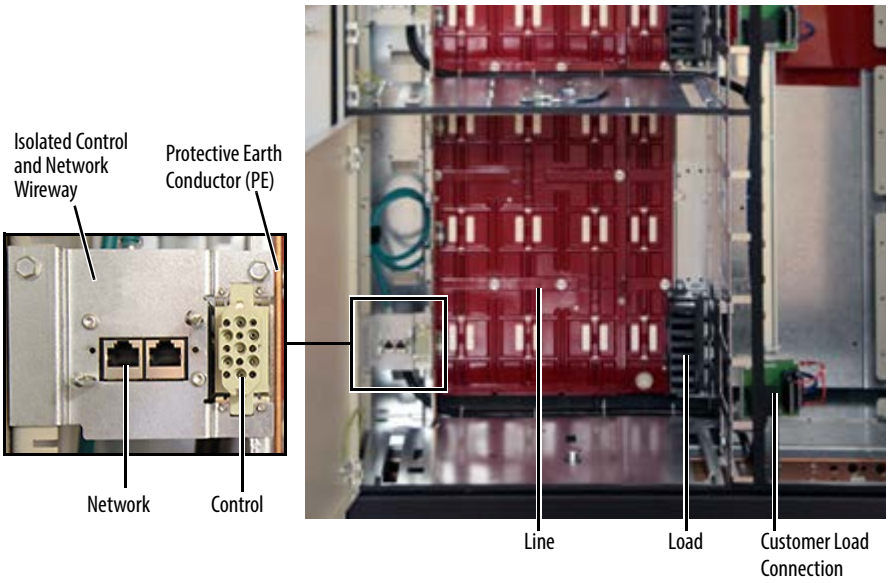


Figure 23 - Withdrawable Unit Connections – Two or More Modules

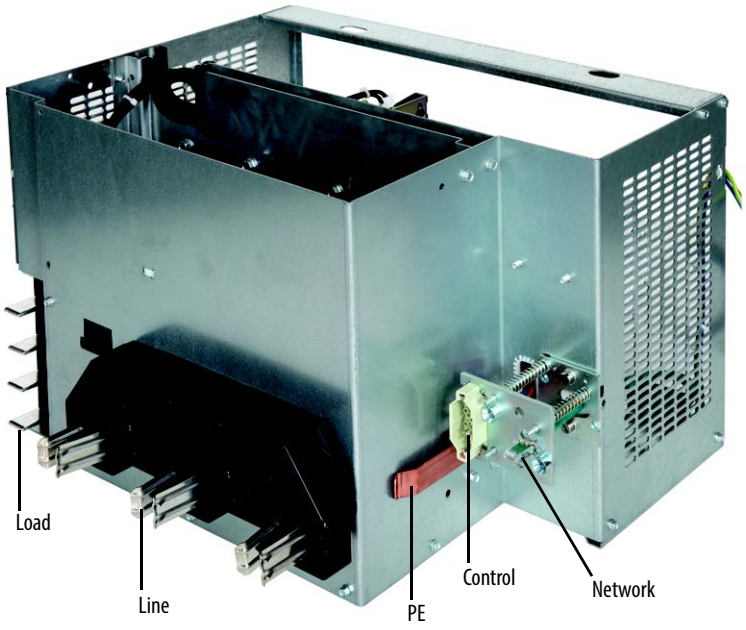


Figure 24 - Withdrawable Unit Connections – One Module

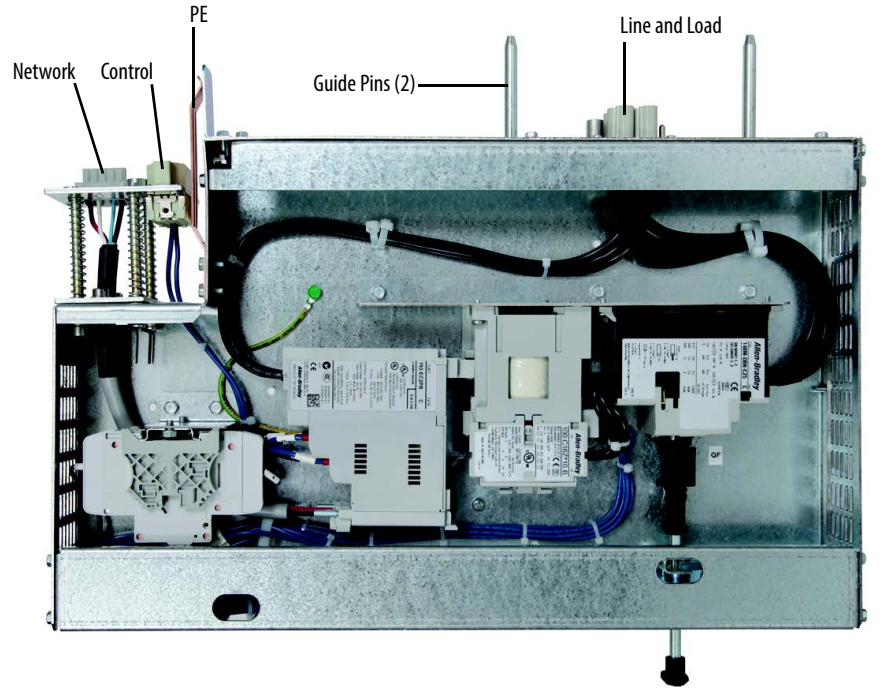
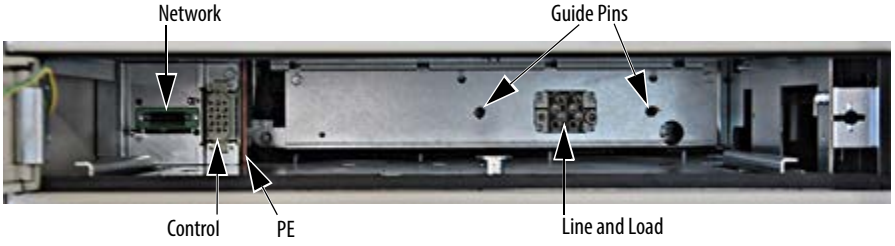


Figure 25 - Subplate Connections for One Module Withdrawable Units



Operating Positions

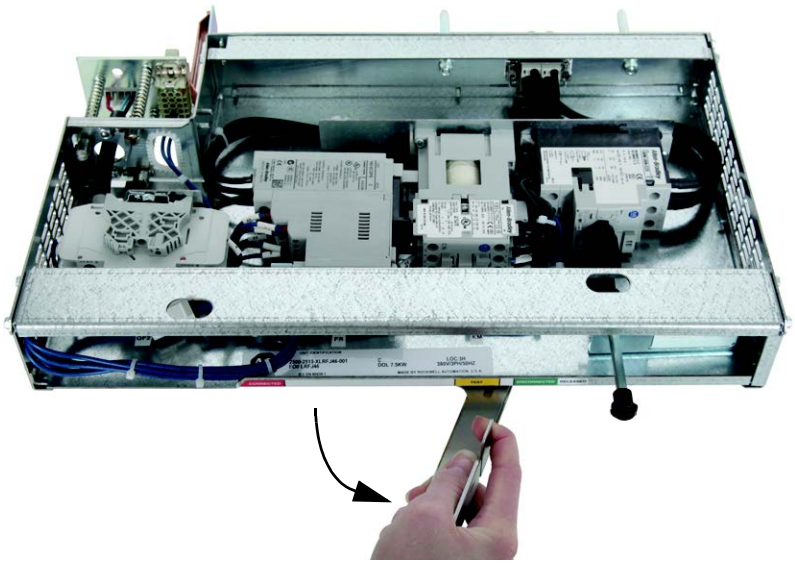
Withdrawable units have four operating positions: **Connected**, **Test**, **Disconnected**, and **Released**. Detents are present to confirm that the unit is in one of the four positions. An interlock helps prevent the unit from being inserted or removed while the branch circuit device is in the ON/I position. Stabs are provided to make the line and load connections. A first make, last break PE contact is also provided. Control and network connections plug into an isolated vertical wireway on the left side of the column. See the following descriptions for additional information about the features of each position.

Selecting an Operating Position

1. Grasp the withdraw lever with one hand.
2. Slide the locking mechanism toward the withdraw lever.

3. Rotate the withdraw lever to the desired position.

   Mechanical detents are used to confirm that a position is selected.



4. Release the locking mechanism and withdraw lever.

Connected Position

In the **Connected** position, the line, load, control, network, and PE connections are engaged. Closing the unit door helps to keep the withdraw lever in the connected position. To engage the interlock or turn the branch circuit device to the ON/I position, the unit door must be fully closed.

Test Position

In the **Test** position, the control, network, and PE connections are engaged. Line and load connections are isolated. This helps allow the control and network wiring of the units to be verified. Units can be locked in this position.

Disconnected Position

In the **Disconnected** position, the unit remains in the column but connections are not present. This is an isolated position. Units can be locked in the disconnected position.

Released Position

Withdrawable units can be completely removed from the columns. The lever must be moved out of the **Disconnected** position into the **Released** position before the unit can be withdrawn. When units are removed from the MCC, they are fully isolated from connections.

Safety Guidelines for Installing and Removing Withdrawable Units

ATTENTION: De-energize, lock out, and tag out all sources of power to the MCC when installing or removing MCC units. If MCC units are installed or removed with power applied to the main power bus, follow established electrical safety work practices. Refer to the publication, NFPA 70E: Standard for Electrical Safety in the Workplace®, for further information.

WARNING: If power sources are connected to the motor control center, use extreme caution when inserting units. All busbars and the line sides of the inserted units are energized and contact with these parts can cause injury or death.

ATTENTION: To insure operator safety and prevent equipment damage, we recommend that two people install or remove units that are in the upper six modules or over 1600 mm above floor level.

Units with door-mounted operator handles, switches, and disconnects must be in the OFF/O position before units are inserted or removed.

Do not attempt to install or remove a unit when the unit main switch is in the ON/I position.

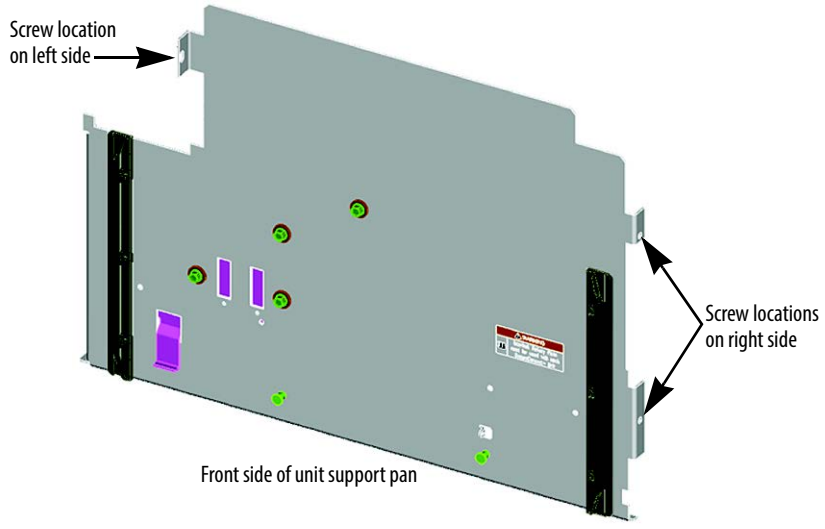
Inserting a Withdrawable Unit

IMPORTANT The unit support pan below the unit compartment must be in place before installing the unit.

Follow these procedures to insert a withdrawable unit.

1. Open the unit door completely and verify the unit support pan has been installed.

   The unit support pan is secured with two screws on the right side and one screw on the left side.



For one module units, verify the subplate is installed. The subplate is attached to the column with two mounting screws.

2. Rotate the unit withdraw lever to the **Released** position.
3. Slowly slide the unit into the column along the tracks on the unit support pan until it locks in the **Disconnected** position.
4. Slide the locking mechanism toward the withdraw lever, rotate the withdraw lever to the **Test** position, and continue to insert the unit into the column.

   The unit locks in the **Test** position.
5. Slide the locking mechanism toward the withdraw lever again, and rotate the withdraw lever to the **Connected** position.

   Vertical bus shutters automatically opens as the unit is inserted.
6. Insert the unit until it locks in the **Connected** position.

   The unit is now installed in the column.
7. Connect any door mounted devices.
8. Close the unit door and secure the door latches.

   Refer to Selecting an Operating Position on page 62 for additional information on the withdraw lever.

Removing a Withdrawable Unit

1. Open the unit door completely.
2. Unplug or remove door mounted pilot devices.
3. Slide the locking mechanism on the withdraw lever to the left and rotate the withdraw lever to the **Test** position.
4. Slide the locking mechanism toward the withdraw lever and rotate the withdraw lever to the **Disconnected** position.
5. Slide the locking mechanism toward the withdraw lever again and rotate the withdraw lever to the **Released** position.

   Continue to slide the unit out of the column. The unit can now be completely removed from the column.

   Shutters close automatically as the unit is removed.
6. Close the unit door and secure the door latches.

Removing the Unit Door

It is not necessary to remove the unit door to install or remove a unit from a column. However, if a unit door must be removed, use one of the following procedures.

If present, door-mounted control stations can be removed from the door and kept with the unit.

Before performing work on units or unit doors, make sure the unit main switch is in the OFF/O position.

Multiple Module Unit Doors

Follow this procedure to remove multiple module unit doors.

1. Make sure the unit main switch is in the OFF/O position.
2. Release each door latch.
3. Open the unit door completely.
4. Remove and/or disconnect door-mounted devices and wiring.
5. Slide the hinge pins upward to remove.
6. Swing door to near closed position and lift outward to remove.
7. To install the unit door, reverse this procedure.

One Module Unit Doors

Follow this procedure to remove one module unit doors.

IMPORTANT Remove the unit from the column **before** removing its door. Follow unit removal procedures on page 65.

1. Make sure the unit main switch is in the OFF/O position.
2. Release each door latch.
3. Open the unit door completely.
4. If a control station is provided with a plug for control wires, unplug this connection before removing the unit.
5. Remove and/or disconnect door-mounted devices and wiring.
6. Remove the two screws that fasten the hinge to the column.
7. Remove the unit door and hinge assembly from the column.
8. To install the unit door, reverse this procedure.

Commissioning

Introduction

This chapter provides guidance for the startup of a newly installed MCC.

We recommend that you make an itemized list that includes the following:

- Serial number
- Number of columns
- Number of units and their corresponding voltage
- Current ratings
- Kilowatt ratings
- Types of circuits
- Fuse sizes
- Circuit breaker ratings and trip settings
- Other important data

This itemized list should be saved in a file along with other data for the MCC such as, component manuals, MCC manuals, overload relay instructions and wiring diagrams.

Pre-commissioning Checklist

ATTENTION: Follow applicable company safety procedures.

ATTENTION: To protect the safety of personnel performing the pre-energizing check, verify remote MCC power sources are disconnected and locked in the OFF/O position. Follow local codes and guidelines in addition to the requirements of EN 50110.

Use a voltmeter to verify that the remote MCC power sources are disconnected.

ATTENTION: Power factor correction capacitors (PFCCs) must be applied correctly. When PFCCs are connected to the motor circuit and the start-up procedure requires the respective motors to be jogged, inched or bumped (rotation direction check), temporarily disconnect PFCCs.

For additional assistance, contact your Rockwell Automation representative.

ATTENTION: Verify that motor acceleration times are within specific application specifications.

Excessive starting currents and/or acceleration times can cause inverse time circuit breakers, power fuses, overload relays, and other components to overheat and/or shut down equipment.

The following procedures should be executed only by a 'skilled person' as defined by IEV 195-04-01 and 3.52 of IEC 60204-1, as follows:

'Skilled person
Person with relevant education and experience to enable him or her to perceive risks and to avoid hazards that operation or maintenance of a product can create.'

Follow these procedures for completing the pre-commissioning checklist.

1. Check and verify that the MCC is installed per instructions.

   See Chapter 3, Install Columns.

2. Inspect and verify that the MCC is level and secured.
3. Inspect the enclosure and units for damage and verify that electrical clearances have been maintained based on the voltage and impulse rating of the equipment.
4. Remove all blocks or temporary holding means used for shipping component devices in the MCC.
5. Check the integrity of the bus splice connections.

   Recommended torque values can be found on the information label on the interior of the vertical wireway door or on the interior right side plate of fixed units.

   See Chapter 3, Install Columns for splicing information.

   TIP The factory-made horizontal power bus to vertical distribution bus connections are tightened by a computer-controlled torquing system. Therefore, these components do not need torquing by the customer.

6. Check and verify that all PE connections are made, based on applicable codes and standards.

   If the PE conductor is not provided or has been removed, verify MCC columns are connected with joining hardware to provide a continuous PE path. See Joining Columns on page 37 for more information.

7. Perform the following for field wiring:
   a. Check the field wiring for proper conductor sizing.
   b. Verify all incoming and outgoing power wiring is secure, well supported, and braced to withstand the effects of a fault current as detailed in Chapter 4, Install Cable.

For incoming line compartments of 8 modules or less: the incoming cables should be firmly secured halfway between the top of the column and the incoming line compartment terminals.

For full-line (24 modules) incoming line compartments: the cables should be braced every 300 mm if the system's available short circuit current is less than 42,000 amperes rms symmetrical. If the system's available short circuit current is greater than or equal to 42,000 amperes rms symmetrical, current bracing should occur every 150 mm.

c. Check the integrity of all field connections.

Recommended torque values not found on individual devices can be found on the unit wiring diagrams.

d. Check field wired connections made to the MCC.

Refer to wiring diagrams and verify that proper clearances between adjacent phases and/or phases to PE are being maintained.

8. Verify the voltage and kilowatt ratings on the motor correspond with the MCC unit ratings.
9. Verify that proper overload relays are installed and/or adjusted to relative full load current shown on the motor rating nameplate.
10. For applications requiring power fuses, install fuses in fusible switches in accordance with application requirements.

IMPORTANT Do not apply grease or NO-OX-ID to fuse ferrules.

11. For circuit breaker applications, verify that the circuit breakers are in accordance with application requirements, and have correct amperage and trip settings.

TIP High efficiency motors can have higher locked rotor and inrush currents, which require higher magnetic trip settings.

ATTENTION: Rockwell Automation AC drives and soft starter units are shipped with preset factory settings such as ramp speed, current limits, switch positions, and readouts. Preset factory settings are not suitable for some applications. Refer to instruction manuals, supplied with the MCC, for specific start-up guidance.

12. Set and verify adjustable current, voltage and other settings, according to device instructions or wiring diagrams.

Refer to the device instruction sheets or manuals supplied with the MCC for specific start-up guidance.

Component devices in MCC units (such as transfer switches, power factor correction capacitors, transducers, motor protectors, line monitors, over and under-voltage relays, and motor windings heaters) can require unique start-up procedures.

13. Manually exercise all switches, control auxiliary switches, circuit breakers, their respective operators, unit interlocks, trip mechanisms (test by pushing the Push to Trip button) and any other operating mechanisms to verify proper operation.
14. Check timing relay settings as required.
15. Verify vents are free from obstructions.
16. Check that fans used for forced air cooling have:
    a. Shafts that rotate freely
    b. Blades with no dust or debris build-up
17. Check that all filters are in place and clean.

    TIP We recommend that you set up an inhouse program for scheduled cleaning or replacement.
18. Check all current transformers for proper polarity.

    Verify transformer secondaries are NOT open, and are either connected to their respective devices or shorted. Reference individual unit wiring diagrams and schematics for proper installation.

ATTENTION: Current transformer secondaries should not be "open." To avoid possible injury and electrical shock to personnel, do not energize a current transformer with its secondary open.

19. Verify **all barriers and parts removed during the installation process have been reinstalled**.

    We recommend that a barrier checklist is developed including such items as, unit location, and barrier location. This checklist should be saved for future reference.
20. Before closing the enclosure and/or individual units, remove all tools, metal chips, scrap wire, and other debris from the MCC interior.

    If there is an accumulation of dust or dirt, clean out the MCC by using a brush, vacuum cleaner, or a clean, lint-free rag. **DO NOT use compressed air—it redistributes contaminates on other surfaces**.
21. Verify all withdrawable units are in the **Connected** position.

    Close and latch unit and wireway doors, ensuring that wires are not pinched. Column closing plates must be in place.

ATTENTION: When conducting an electrical insulation resistance test, isolate equipment sensitive to high test voltages, such as meters, solid state devices, motor winding heaters, capacitor units, and transformers.

22. Conduct an electrical insulation resistance test to verify MCC wiring integrity. Conduct this test with an insulation resistance (megger) tester with a potential of 500...1000 volts.

ATTENTION: Verify all switches or circuit breakers are in the OPEN/I or Off/O positions before conducting an electrical resistance test.

Conduct this megger test phase-to-phase, phase-to-PE and, when applicable, phase-to-neutral on the MCC buswork. Typical insulation resistance values are 50 megohms or greater.

Insulation resistance values are affected by temperature, humidity, or dampness, which can cause a considerably lower insulation resistance reading. If the insulation resistance values are less than one megohm (due to dampness, temperature or humidity) or the MCC has been stored in a damp or humid area, it is recommended the equipment be dried out. Dry out motor cables by injecting a low voltage current or by using space heaters.

Once the equipment is dry, repeat the insulation resistance test. The minimum value for insulation resistance on a new installation at startup or energizing is 1 megohm. These readings can be recorded in Megger Reading Recording Table on page 94.

Next, check the field wiring, for example, motor cables and/or incoming line cables.

Commissioning Procedure

ATTENTION: Commissioning a motor control center must be done only by skilled personnel with proper personal protective equipment. Energizing a MCC for the first time is potentially dangerous. Serious damage and/or personal injury can occur. Follow local codes and guidelines in addition to the requirements of EN 50110.

ATTENTION: This procedure is provided as a general guideline for energizing a newly installed CENTERLINE 2500 MCC and **should be used only after the Pre-commissioning Checklist has been completed.**

Read this procedure in its entirety before beginning the commissioning procedure. If you have any questions or concerns, contact your Rockwell Automation representative.

1. Review other instructions supplied for the proper operation of special units such as AC drives and soft starters, with appropriate and skilled personnel.
2. Verify that main and unit main switches are in the OFF/O position so there is no load on the MCC.

   Also, verify that associated remote devices are de-energized.
3. Latch doors and secure covers.

4. Energize the MCC remote power source.

   If the MCC has a main circuit breaker or disconnect switch that can be operated from a remote location, energizing from the remote location is strongly recommended.

   If the MCC main circuit breaker or disconnect switch cannot be energized from a remote location, follow the procedure below.

   - De-energize the remote power source
   - Close MCC main disconnect or circuit breaker switch.
   - Re-energize the MCC remote power source.

   ATTENTION: Main switch handles should be operated with a firm, direct motion into the closed (ON/I) position.

5. Energize from the source of the system, working toward the loads.

   Energize one unit at a time, beginning with control units then feeder units.

6. Fully withdrawable units can be commissioned in the Test position.

   This position helps allow control and network connections to be tested without engaging three phase power.

   See Chapter 6, Install and Remove Units for more information on operating positions.

7. After the disconnect devices have been closed, loads such as lighting circuits, motor starters, and contactors can be energized.

   a. When power factor correction capacitors are energized with the motor windings and the start-up procedure requires that the respective motors be jogged or inched, temporarily disconnect the power factor correction capacitors. For more information on power factor capacitors and MCC units, contact your local Rockwell Automation Representative.

   b. Verify that acceleration times are within application specifications.

      TIP Excessive starting currents and/or acceleration times can cause inverse time circuit breakers, power fuses, overload relays and other components to overheat and/or shut down equipment.

8. Verify meters, including voltmeters and ammeters, are working properly.

9. Reset device settings that were adjusted during installation and commissioning to appropriate operational settings.

   For commissioning MCCs with the DeviceNet network and/or IntelliCENTER software, refer to the CENTERLINE 2500 DeviceNet Motor Control Centers Technical Data, publication 2500-TD002, or CENTERLINE 2500 Motor Control Centers with EtherNet/IP Network Technical Data, publication 2500-TD003.

Maintenance

ATTENTION: Only skilled personnel should oversee the maintenance and servicing of motor control centers.

De-energize all power sources before performing maintenance or service work on columns or units.

Follow local codes and guidelines in addition to the requirements of EN 50110 when working on energized equipment.

Replace and secure all barriers, covers, shields and doors, and perform the Pre-commissioning Checklist on page 67 before re-energizing the equipment.

Establish a Maintenance Program

A periodic preventative maintenance program must be established for MCCs to help avoid unnecessary downtime. At a minimum, checks must be made once a year. If equipment within the MCC is subject to heavy duty or highly repetitive operation, more frequent maintenance can be necessary. Use the following suggested maintenance guidelines to establish a maintenance program.

Keep a log of service and maintenance work performed on your MCC. Record the following information.

- Date test and maintenance work is performed
- List of checks and tests performed
- Condition of the equipment
- Any repairs and/or adjustments made to equipment

For maintenance regarding specific components, such as circuit breakers, contactors, AC drives, relays, and meters, reference the specific component instruction manual for each device.

Suggested Maintenance Guidelines

This table provides some suggested guidelines for maintaining your MCC.

Suggested Maintenance Guidelines		Date	Remarks	Initials
1. Environment	• Verify operating (ambient) conditions. – Room temperature range: -5…40 °C[1] – Non-condensing humidity, max: 95% at 40 °C[1]			
2. Enclosure Exterior	• Clean surfaces. Retouch painted surfaces if necessary. • Check that door latches are functioning and secure. • Inspect for signs of excessive heat in the following locations: – Doors – Enclosure sides If severe corrosion or discoloration is evident, replace the damaged components. **Identify the cause of damage and make necessary repairs.**			
3. Contaminants	**ATTENTION:** Follow local codes and guidelines in addition to the requirements of EN 50110 when working on energized equipment. • Check for contaminants (moisture, dirt, dust) inside the enclosure. Contaminants must be removed and the source eliminated. • Check for contaminants in the following locations: – Cable entry and exit points, seams and openings – Devices (push buttons, relays, and disconnect switches) **Make sure the source or cause of wetness or moisture is identified and eliminated.**			
4. Bus System	**ATTENTION:** De-energize all power sources before performing maintenance or service work on columns or units. • Check the bus support and insulation for cracks and/or damage. • Inspect bus splice connections for discoloration. • Verify the integrity of bus splice connections. Re-torque connections. See label inside vertical wireway door for recommended torque values. • Use a vacuum or a lint free cloth to clean the bus and supports. • Conduct an electrical insulation resistance (megger) test. Record and save the results. See Pre-commissioning Checklist on page 67.			
5. Operating Handles	• Verify that operator handles move freely (no sticking or binding). • Check functions of the operator handles. • Check the defeater mechanisms on operator handles. • Replace broken, deformed, malfunctioning or badly worn parts/assemblies.			
6. Locking Devices	Check locking and interlocking devices for proper working condition. Replace as necessary.			
7. Current Carrying Components	• Inspect for discoloration, corrosion, wear, excessive heat and other signs of possible failure. • Current carrying devices can include fuse clips, line, and load terminals.			
8. Contacts	• Check for excessive wear and dirt accumulation. – Vacuum or wipe contacts with a soft cloth to remove dirt. **Note:** Applicable only for Allen-Bradley® 100-D size contactors (95-860A). • Replace contacts in complete sets to avoid misalignment and uneven contact pressure. • Discoloration and/or slight pitting of the contacts is normal. • Do not file contacts or use spray cleaners.			

Suggested Maintenance Guidelines		Date	Remarks	Initials
9. Coils	• Check contactor and relay coils for signs of overheating (cracking, melting or burnt insulation). – If signs of overheating are present, replace the coil. • Correct the overvoltage or undervoltage conditions that caused coil failure. • Clean any residue of melted coil insulation from other parts of the device or replace such parts.			
10.Terminals	• Check for loose wire connections and tighten as necessary. • Check schematics/component documentation for torque values. – Power terminals – Control circuit terminals • Replace damaged parts or wiring.			
11.Pilot Lights	Replace damaged lamps and lenses.			
12.Fuses	• Check fuses and fuse clips. – When replacing fuses, install the same type and rated fuse that was originally furnished with the MCC.			
13.Fans and Cooling Devices	• Inspect blowers and fans for operation and damage. – Replace blowers and fans that have bent, chipped or missing blades, or if the shaft does not turn freely. • Clean or change air filters for fans. • Clean heat exchanger fins.			
14.Solid State Devices	• Perform a visual inspection. Components or circuit boards must be replaced if the following are found: – Discoloration – Charred or burned components • Check printed circuit boards for: – Proper seating in the edge board connectors – Locking tabs in place			
15.Unit Stabs	• Inspect stabs for wear and/or corrosion. Replace if necessary. – If the line stab assembly is severely pitted, inspect the vertical bus for wear and pitting. Replace as necessary. • Lightly lubricate line and load stabs with NO-OX-ID grease before installing the unit into the column.			
16.Control and Network Plugs	• Inspect for bent or damaged pins. – If necessary, clean the contacts. • Verify the connector mechanism is functioning properly.			
17.Withdrawable Units	• Remove dust and grease from the guide rail. • Check that the withdraw lever and locking mechanism operate freely. • Check for easy movement of withdrawable units within the column. • Test the unit interlock function.			
18.Final Check	• Verify all withdrawable units are in the correct operating position (Connected, Test, Disconnected, Withdrawn). • Verify enclosure doors and wireway covers have been closed and are secure. • After performing maintenance or repair, test the control system for proper functioning under controlled conditions.			

(1) The average temperature over a 24-hour period must not exceed 35 °C.

Notes:

IntelliCENTER Options

EtherNet/IP Motor Control Centers

Basic information is provided in the following sections. For additional information, refer to CENTERLINE 2500 Motor Control Centers with EtherNet/IP Network, publication 2500-TD003.

Connection Count

The EtherNet/IP network can accommodate a vast number of nodes. The EtherNet/IP network does not have a specific maximum number of nodes like other fieldbus networks. The limit is based on the number of connections the EtherNet/IP scanner can make.

To estimate the number of connections a network uses, visit http://www.rockwellautomation.com/solutions/integrated architecture/resources3.html for our EtherNet/IP Capacity Tool.

Cable Length Limitations

The EtherNet/IP network uses fiber or copper twisted-pair wiring. The maximum length of copper twisted-pair wiring is 100 m between devices. There is no cumulative length for the entire network. Fiber cable length varies by cable design. Inside the MCC, all cables are copper twisted-pair.

IMPORTANT	The 100 m maximum length must account for Ethernet cable inside the column. To help determine cable lengths for your application, each MCC is shipped with documentation identifying the cable length used within the MCC. This cable length must be added to the length between the Grace port and the externally-connected device.

Cable Routing

Each EtherNet/IP network has one or two Stratix 6000™ switches typically mounted in the top horizontal wireway in the standard configuration. The number of switches depends on the number of units in the column. Cables connected to the switch are then routed to EtherNet/IP devices in the column. Up to 12 EtherNet/IP ports can be provided in each CENTERLINE 2500 column.

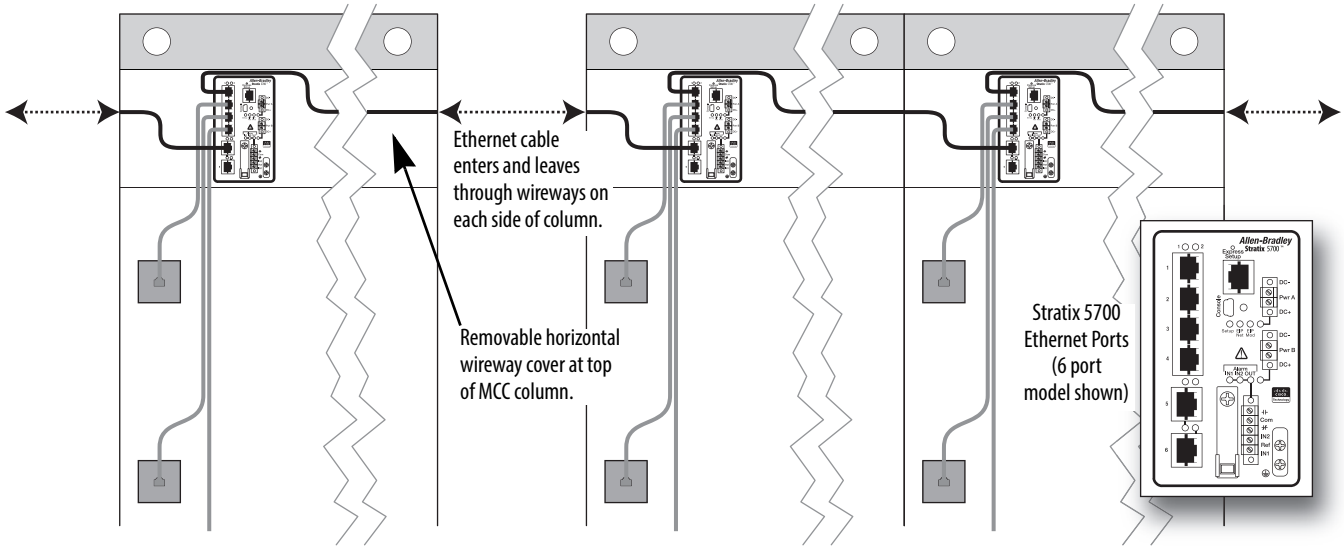
In a standard MCC column, the vertical network wireway has EtherNet/IP connections equal to the number of units (up to 12) for that column. Devices that require 24V DC to power up must have it supplied through pins B4 and B5 in the control plug.

IMPORTANT Pins B4 and B5 in the control plug are reserved for 24V DC power; avoid using for other reasons.

Connection to the EtherNet/IP network and the control plug is made when a unit is in the Connected or Test position.

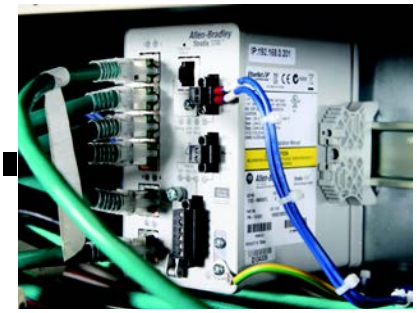
Adding or removing a unit from the EtherNet/IP system does not interrupt the operation of other units in the system.

Figure 26 - EtherNet/IP Network Connections in 2500 MCC Units


Ethernet cable enters and leaves through wireways on each side of column.
Removable horizontal wireway cover at top of MCC column.
Stratix 5700 Ethernet Ports (6 port model shown)
Ethernet cable routing through typical single MCC column.
Ethernet cable routing through typical two MCC columns.

NOTE: Examples above depict typical 2500 MCC configurations with EtherNet/IP communication. Refer to 2500-TD003 for more information on EtherNet/IP communication for 2500 MCC units.

Refer to 1783-UM004 for more information on Stratix 5700 Ethernet-managed switches.



Stratix 5700 switch behind top horizontal wireway cover.

Determining Cable Lengths

To help determine cable lengths for your application, each MCC is shipped with documentation identifying the cable length used within the MCC.

MCC Cable Types

ATTENTION: Do not apply high voltage to any installed EtherNet/IP cable system or its connectors.

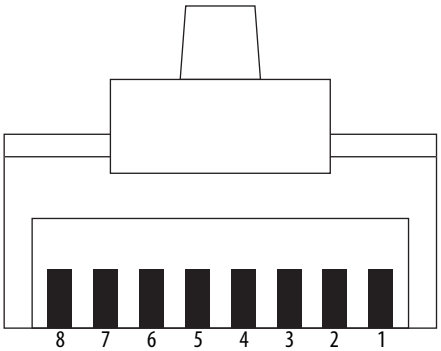
The CENTERLINE 2500 MCCs use a high voltage 600V Ethernet cable designed to perform above TIA 568-B.2 and ODVA Ethernet standards. These cables have the following features:

- Foil and braided shield, PVC, eight conductor (four pair)
- 600V PVC cable designed to support high voltage applications
- On-machine rated cable for use in a cable tray shared with high voltage power cables
- RJ45 insulation displacement connector available for field terminations
- Wide thermal operating range

Table 5 - EtherNet/IP Cable Specifications for MCCs

Certifications	UL and cUL Listed
Outside diameter	0.32 ± 0.015 in. (8.13 ± 0.38 mm)
Operating temperature	-20…80 °C
Cable rating	UL, cUL TYPE CMG; UL PLTC or UL AWM 2570 80C 600V, TIA 568B

Figure 27 - EtherNet/IP Cable Pin-out



Pin No.	Cable Color	Description
1	White/Orange	TxData +
2	Orange	TxData -
3	White/Green	Recv Data +
4	Blue	Unused
5	White/Blue	Unused
6	Green	Recv Data -
7	White/Brown	Unused
8	Brown	Unused

Adding a MCC Unit to an EtherNet/IP System

Use this section to add Bulletin 2500 units to an EtherNet/IP MCC. Each EtherNet/IP component is factory wired within the unit and has a communication cable that plugs into the device on one end and generally into a vertical wireway EtherNet/IP port on the other end.

No. of Conductors	Jacket Material	Cable Type	Cable Rating	Cat. No.(1)
8	Teal 600V PVC	Foil and braided shield	(UL) CMX, CMR; c(UL) CMG; (UL) PLTC or AWM 2570 80 °C 600V; TIA-568-B	1585J-M8HBJM-2
	Red 600V PVC			1585J-M8EBJM-2

(1) Replace -2 (2 m) with -5 (5 m), or -10 (10 m) for additional standard cable lengths.

Ethernet Power Supply

IMPORTANT Many EtherNet/IP components require 24V DC power source to operate. The power supply must be EtherNet/IP compatible as specified in the ODVA requirements.

Power supplies that do not satisfy both points listed above can result in damage to the EtherNet/IP signal and components, as well as failure to comply with local codes and inspection.

A power supply unit that meets EtherNet/IP requirements can be supplied with the MCC. A cable connects the output of the power supply to pins C3 and C4 of the control plug in the network wireway. This cable is already connected when the power supply unit ships installed in the MCC. Redundant configurations are also available.

Connecting Power Supplies–Remote or in the MCC Lineup

Connect power supplies according to guidelines to minimize voltage drops in the EtherNet/IP system while providing proper supply voltage to system devices. Refer to the Converged Plant-wide Ethernet Design and Implementation Guide, ENET-TD001, for detailed connecting instructions.

Network Power Supply and the Protective Earth Circuit

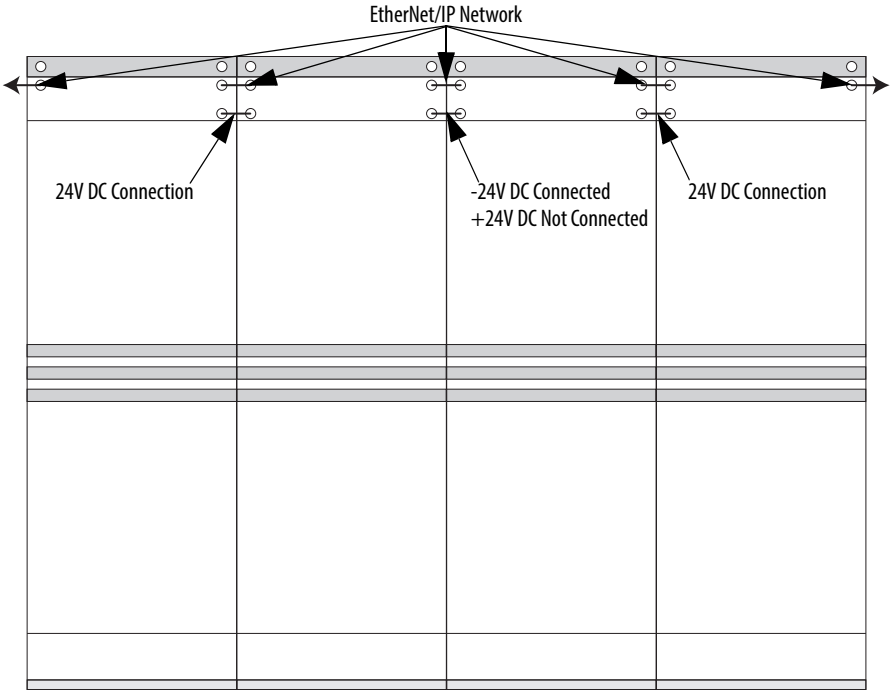
The EtherNet/IP network is grounded at the various components via the component ground. Therefore, no further grounding needs to be connected to the Ethernet cables.

IMPORTANT Do not connect the 24V DC common in the power supply bucket to the PE. Doing so violates the grounding guidelines for the various EtherNet/IP components.

Connecting Two Power Supplies

Install an additional 24V DC Class 1 power supply for MCC lineups with 14 or more columns. When using two supplies, provide a break between the two 24V DC networks. Locate the appropriate break for the two networks and verify the terminal blocks are not connected between these two columns.

Figure 28 - Connecting Two Power Supplies



Position each power supply so it feeds a maximum of seven columns to the left or right (refer to the sample lineup above).

System Design Installation Checklist

When installing an EtherNet/IP MCC, verify the following before applying power to the network:

- Only one power supply is connected for each 14 sections of MCC.
- The power supply for the system is 24V DC.
- The PE is connected.
- Connections are inspected to detect and correct any loose wires, opens, or shorts.

EtherNet/IP Software Installation Checklist

The following steps, along with references for more information, are provided to assist with the EtherNet/IP software installation process.

1. Install the communication card in your personal computer.
2. Load the Windows hardware drivers for the communication card.
3. Load RSLinx® software.
4. Configure the RSLinx driver.

   Within the RSWho function, make sure no unrecognized devices (the '?' symbols) appear for any devices. If an unrecognized device appears, load the electronic data sheet (EDS) file.

   Refer to the Electronic Data Sheets (EDS) section below for additional details.

   IMPORTANT Do not leave the RSWho constantly browsing. Close the RSWho screen or disable Autobrowse.

5. Use the device web pages or RSLogix™ 5000 software to program and configure devices (for example, full load current, acceleration rate).
6. Write the PLC program.
7. If IntelliCENTER software is provided, load per the IntelliCENTER Software User Guide, publication MCC-UM001.

DeviceNet Motor Control Centers

This section explains how to connect the terminating resistors and join the DeviceNet cables.

Preparing a DeviceNet System for Commission

If your CENTERLINE 2500 MCC is equipped with DeviceNet, terminating resistors must be installed prior to commissioning. If your MCC consists of more than one shipping block, DeviceNet splicing cables need to be installed as columns are joined together.

Basic information is provided in the following sections. For additional information, refer to DeviceNet Motor Control Centers (MCCs), publication 2500-TD002.

Terminating Resistors

IMPORTANT	The DeviceNet network only operates correctly when there are exactly two terminating resistors, one at each end of the network trunk line.

Terminating resistors are necessary at the ends of trunk lines to reduce reflections of the communication signals on the network.

Refer to Figure 29 for more information.

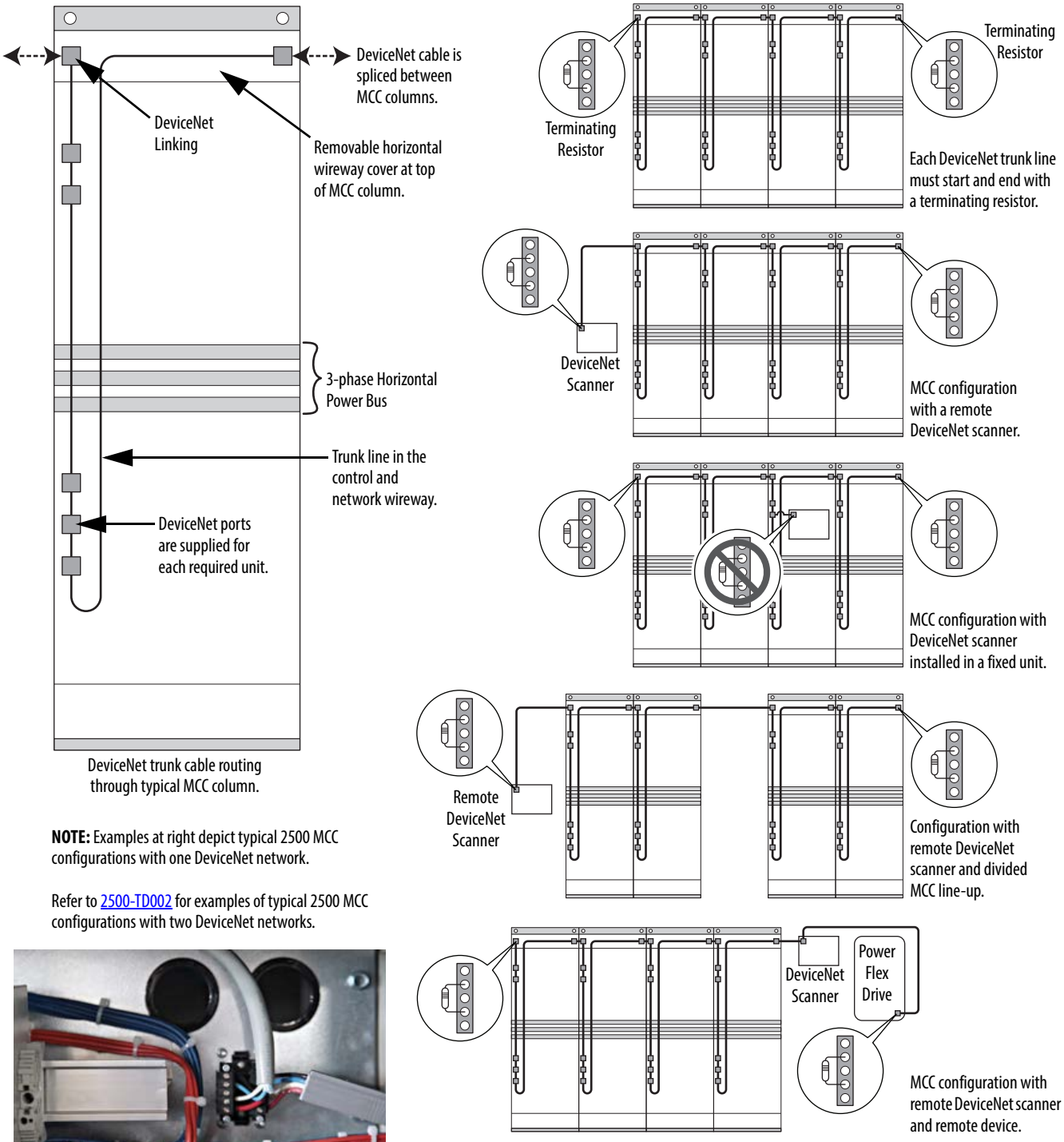
Follow these procedures to install terminating resistors.

1. Locate the terminating resistor kit.

   Terminating resistor kits are shipped in the top horizontal wireway. A removable white label indicates the location of the kit.
2. Remove the top horizontal wireway cover from each column in the network.
3. Plug the first terminating resistor into the left port in the top horizontal wireway of the left end column in the network and torque the connector screws to 0.55 N•m.
4. Plug the second terminating resistor into the right port in the top horizontal wireway of the right end column of the network and torque the connector screws to 0.55 N•m.
5. Do not replace the horizontal wireway covers until all shipping blocks in the network have been spliced together.

   Refer to Joining DeviceNet Cables on page 86.

Figure 29 - Installing Terminating Resistors and DeviceNet Splicing Cables


DeviceNet cable is spliced between MCC columns.
DeviceNet Linking
Removable horizontal wireway cover at top of MCC column.
3-phase Horizontal Power Bus
Trunk line in the control and network wireway.
DeviceNet ports are supplied for each required unit.
DeviceNet trunk cable routing through typical MCC column.
Terminating Resistor
Terminating Resistor
Each DeviceNet trunk line must start and end with a terminating resistor.
DeviceNet Scanner
MCC configuration with a remote DeviceNet scanner.
MCC configuration with DeviceNet scanner installed in a fixed unit.
Remote DeviceNet Scanner
Configuration with remote DeviceNet scanner and divided MCC line-up.
DeviceNet Scanner
Power Flex Drive
MCC configuration with remote DeviceNet scanner and remote device.

NOTE: Examples at right depict typical 2500 MCC configurations with one DeviceNet network.

Refer to 2500-TD002 for examples of typical 2500 MCC configurations with two DeviceNet networks.

DeviceNet port behind top horizontal wireway cover.

Joining DeviceNet Cables

After the terminating resistors have been installed, DeviceNet cables in each column of the network must be spliced together.

Follow these procedures to join the DeviceNet cables.

1. Locate the DeviceNet splicing cable in the top horizontal wireway.

   One end of the splicing cable is plugged into the right DeviceNet port in the column to the left of the splice.
2. Route the cable through the top horizontal wireway into the column to the right of the splice.
3. Plug the free end of the DeviceNet splicing cable into the left port in the top horizontal wireway of the column to the right of the splice.
4. Torque connector screws on the splicing cable plugs to 0.55 N•m.
5. Verify the horizontal wireway is free of tools and debris.
6. Replace horizontal wireway covers.

DeviceNet Power Supply

IMPORTANT The DeviceNet cable system requires a 24V DC power source to operate. The power supply must be DeviceNet compatible as specified in the ODVA requirements.

Power supplies that do not satisfy both points above can result in damage to the DeviceNet signal and components, as well as failure to comply with local codes and inspection.

A power supply unit that meets DeviceNet requirements can be supplied with the MCC. A cable connects the output of the power supply to a DeviceNet port in the control and network wireway. This cable is already connected when the power supply unit ships installed in the MCC. Redundant configurations are also available.

Remote power supplies should meet the following requirements, per ODVA:

- Rated 24V DC (±1%)
- Rise time of less than 250 milliseconds to within 5% of 24V DC at full load of 8 A
- Current limit protection of 8 amps continuous and 10 amps for the first 250 ms
- Sized correctly to provide each device with its required power—each device typically requires 90...165 mA
- Derated for temperature with the manufacturer's guidelines

Connecting Power Supplies–Remote or in the MCC Line-Up

Connect power supplies according to these guidelines to minimize voltage drops in the DeviceNet system and ensure proper supply voltage to system devices. Refer to the Media Design Installation Guide, DNET-UM072, for detailed connecting instructions.

Network Power Supply and the Protective Earth Circuit

The DeviceNet cable must be connected to the PE circuit at only one location. The ideal choice is at the power supply. Connect the power supply and 24V DC common (black wire) to the PE circuit by using #8 AWG wire.

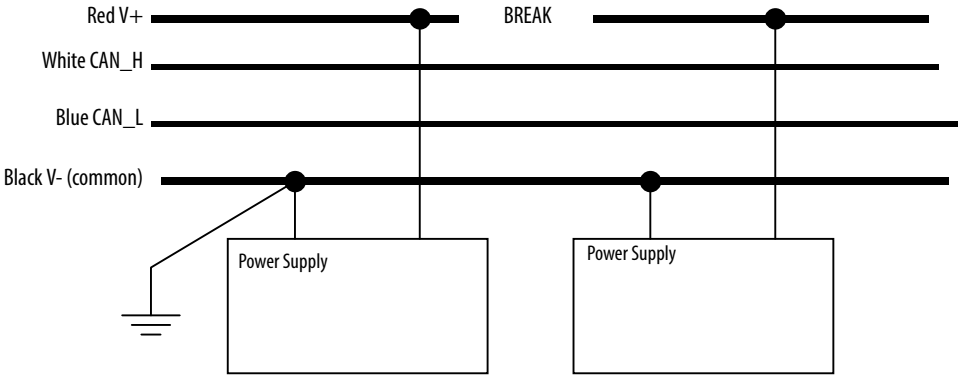
Best PE Practice

- If the power supply comes installed in the MCC, the black 24V DC common terminal is connected to the PE within the unit.
- To improve the connection, use #8 AWG green wire and ground the black 24V DC common terminal to a very stable PE external to the MCC or to an optional true earth (TE) connection inside the MCC.
- If the power supply is external, the same recommendations apply.

Connecting Two Power Supplies

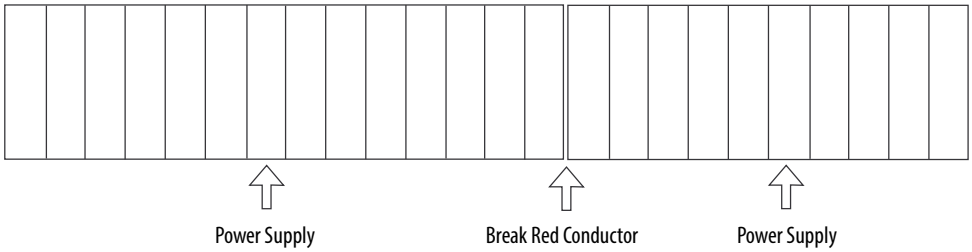
An additional 24V DC Class 1 power supply must be installed for MCC line-ups with more than 14 columns. When using two supplies, the red conductor between the power supplies must be broken. Locate a linking connector between columns and disconnect the red conductor.

Connect only ONE of the two power supplies to the PE.



Position each power supply to ensure that it feeds a maximum of seven columns to the left or right (see the sample line-up below).

MCC Line-Up With More Than 14 Columns



MCC line-ups with more than 14 columns could exceed the 75 m trunk length limit to support 500 kbps communications. When the trunk length exceeds this limit, 250 kbps communications should be specified.

Electronic Data Sheets (EDS)

This section applies to any MCC with IntelliCENTER software installed on a DeviceNet or EtherNet/IP network.

After IntelliCENTER software is installed, an electronic data sheet (EDS) must be registered for each unique device in the MCC. This section details how to perform that task.

Overview

EDS files are simple text files used by network configuration tools—such as RSNetWorx™, RSLogix 5000, or IntelliCENTER software—to help identify products and easily commission them on a network. EDS files describe a product's device type, version, and configurable parameters on a DeviceNet or EtherNet/IP network.

Where to Find EDS Files

The IntelliCENTER data CD has a directory (<cdrom>:\<order>\<item>\EDS) that contains the EDS files necessary for the devices in your IntelliCENTER MCC. The EDS files are automatically registered by the installation program.

An "EDS file" CD is provided that contains EDS files for all DeviceNet and EtherNet/IP products found in MCCs.

Installing EDS Files

EDS files are installed with a program from Rockwell Software® called 'RSHWare.exe'. This program is included on the IntelliCENTER data CD and in the same directory as the EDS files.

Follow these steps to install EDS files for a DeviceNet or EtherNet/IP network.

1. Run the program 'RSHWare.exe'.
2. Click Add/Remove.
3. Select Register an EDS file and click Next.
4. Select Register a directory of EDS files.
5. Browse to the EDS directory on the data CD.
6. Click Next.

   The Installer displays the test results.
7. Click Next to continue.

   The Installer lets you to change the graphic image for each device.
8. Click Next to continue.

   The Installer displays the final task summary.
9. Click Next to continue.
10. Click Finish when completed.

Finding EDS Files for Other Devices

EDS files can be obtained at http://www.rockwellautomation.com/resources/eds/.

Uploading EDS Files from the Device

RSNetWorx for EtherNet/IP or RSNetWorx for DeviceNet software can be used to upload an EDS file directly from a device. If an EDS file cannot be found by other methods, refer to the RSNetWorx help file for steps to upload an EDS file.

Notes:

Worksheets

Sample MCC Layout Worksheet

Figure 30 - Sample MCC Layout Worksheet

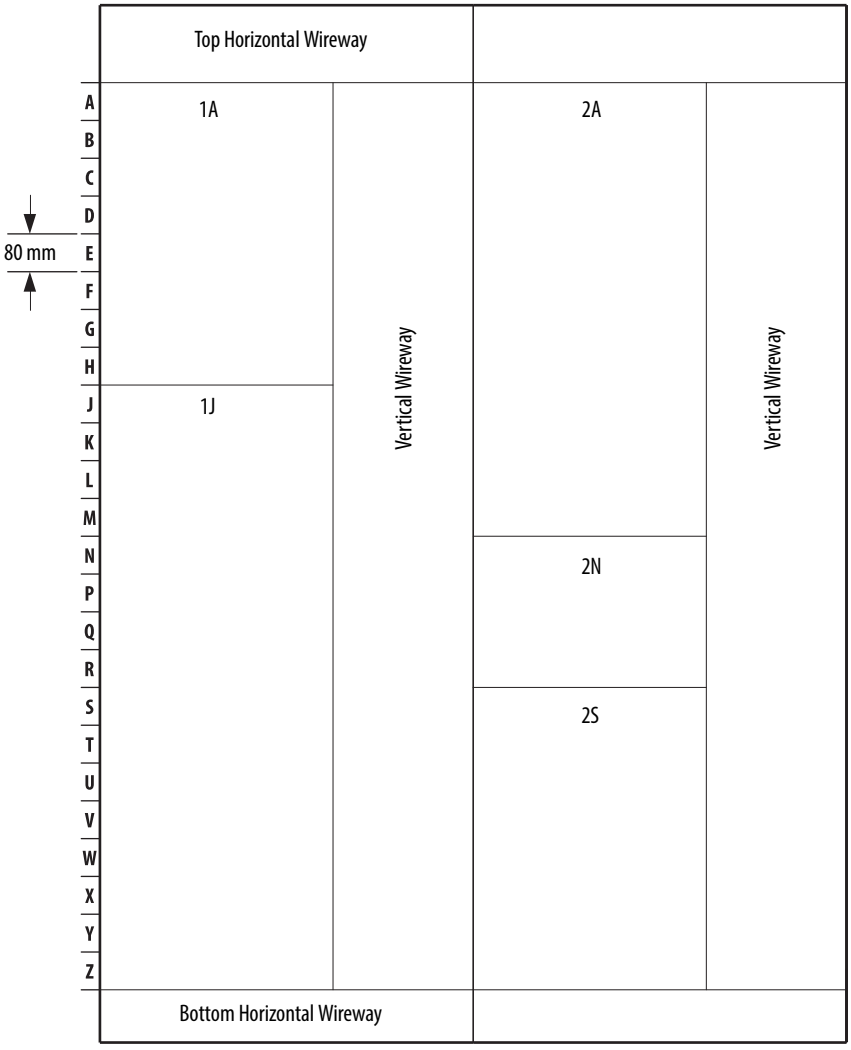


Table 6 - Location of Sample Units within above MCC Layout

Unit Location	Unit Data								
	Serial Number	Wiring Diagram	Size or Amp Rating	Description	Full Load Current	Overload	Kilowatts	Circuit Breaker Trip Setting	Power Fuse Rating
1A		Y-359039	1200A	MLUG					
1J		Y-359043		DOL			185		
2A		Y-359042		DOL			110		
2N		Y-359041		DOL			22		
2S		Y-359045		XFMR					

Table 7 - Motor Control Center Layout Worksheet

MCC Name / Number _____

Unit Location	Unit Data								
	Serial Number	**Wiring Diagram**	**Size or Amp Rating**	**Description**	**Full Load Current**	**Overload**	**Kilowatts**	**Circuit Breaker Trip Setting**	**Power Fuse Rating**

Table 8 - Megger Reading Recording Table

MCC Name / Number _____

Date	Circuit / Unit Name / Number	Phase-to-Phase			Phase-to-PE			Phase-to-Neutral		
		A - B	B - C	C - A	A - PE	B - PE	C - PE	A - Neut.	B - Neut.	C - Neut.

The following terms and abbreviations are used throughout this manual. For definitions of terms not listed here, refer to the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

Column Vertical segment of a motor control center. Columns consist of the bus system, units and wireways. Sometimes referred to as cubicle.

Conduit Metal tube that encloses electric wires and cables.

Connected position Plug-in unit operating position in which the line, load, control, network, and protective earth (PE) connections are engaged. For more information, refer to Chapter 6, Install and Remove Units.

Control station Door mounted assembly that houses push buttons, indicator lights and other small control devices.

Control unit Unit that contains any type of power control or metering device including starters, contactors, AC drives and soft starters.

Disconnected position Plug-in unit operating position in which line, load, control, network, and protective earth (PE) connections are disengaged, but the unit is still housed in the column. For more information, refer to Chapter 6, Install and Remove Units.

Double-front Configuration in which columns are installed back-to-back. Columns with double-front construction contain separate power bus systems that are spliced together.

Feeder unit Unit containing a disconnection means used to distribute power to a remote device.

Fixed unit Unit that is permanently mounted in a column. These units typically house components that are large and/or require more current capacity than a plug-in unit can provide. Sometimes referred to as a frame-mounted unit.

Locking mechanism Part of the withdraw lever. This mechanism must be engaged to select unit operating positions. (See Selecting an Operating Position on page 62).

Main switch Disconnecting means for a motor control center. Available in two types: circuit breaker or disconnect switch.

Module space Grid size used to determine space distribution within the motor control center. Height of one module is approximately 80 mm. Module width is 500 mm.

Motor control center (MCC) One or more columns operating with a common power bus.

Plating Type of surface treatment that distributes a layer of protective coating on structural parts.

Plug-in units Removable units with line connections made via unit bus line stabs. Plug-in units include withdrawable units. Sometimes referred to as withdrawable or removable units.

Protective earth conductor (PE) Protective circuit busbar. Sometimes referred to as earth bar.

Released position Plug-in unit operating position in which line, load, control, network, and protective earth (PE) connections are disengaged and the unit is removed from the column. For more information refer to Chapter 6, Install and Remove Units.

Shipping block A single column packaged for transport or multiple columns joined and packaged together at the manufacturing site for ease of transportation. Shipping blocks cannot be separated at the installation site. Sometimes referred to as shipping splits.

Skilled person "Person with relevant education and experience to enable him or her to perceive risks and to avoid hazards that operation or maintenance of a product can create." IEC 60204-1, 3.52 and IEV 195-04-01.

Stabs Assembly on the back of a unit that is used to make line and load connections. (See Withdrawable Units on page 60).

Test position Plug-in unit operating position in which the control, network, and protective earth (PE) connections are engaged, and line and load connections are isolated. For more information refer to Chapter 6, Install and Remove Units.

Trunk line Main DeviceNet communication cable within the motor control center.

Unit An arrangement of power and/or control devices that are housed together and inserted into a column. A unit can be used to distribute power or control a remote device. The size of units is described by module space.

Unit main switch Disconnecting means for a unit within a motor control center. Available in two types: circuit breaker or fused disconnect.

Withdraw lever Mechanism used to insert and remove withdrawable units. The withdraw lever is used to select an operating position (inserted, test, disconnected, and withdrawn) and has mechanical detents so the lever is securely in position. (See Selecting an Operating Position on page 62).

Withdrawable unit Unit where line, load, control, network and PE connections are made with stabs or connectors. Withdrawable units are inserted and removed by using the withdraw lever.

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